UNITED STATES COAST PILOT

ATLANTIC COAST

SECTION D

CAPE HENRY TO KEY WEST

U. S. DEPARTMENT OF COMMERCE
DANIEL C. ROPER, SECRETARY
COAST AND GEODETIC SURVEY
R. S. PATTON, *Director*

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UNITED STATES COAST PILOT

ATLANTIC COAST

SECTION D

CAPE HENRY TO KEY WEST

FOURTH EDITION

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[1] For a complete and continuous description of the Intracoastal Waterway reference should be made to the publication, Inside Route Pilot, New York to Key West.

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PREFACE

This publication covers the coast from Cape Henry to Key West, including Albermarle and Pamlico Sounds and other tidal waters contiguous to this coast. It is based mainly upon the work of the United States Coast and Geodetic Survey, including the results of a special examination made during 1935.

The volume embraces the same territory as the previous editions of Section D, excepting that only that section of the Intracoastal Waterway between Norfolk and Albermarle Sound, including the Dismal Swamp Canal, has been fully described. The Intracoastal Waterway, Norfolk to Key West, is fully described in a separate publication entitled "Inside Route Pilot, New York to Key West."

Navigators are requested to notify the Director, United States Coast and Geodetic Survey, of any errors or omissions that they may find in this publication, or of any additional matter which should be inserted for the information of mariners.

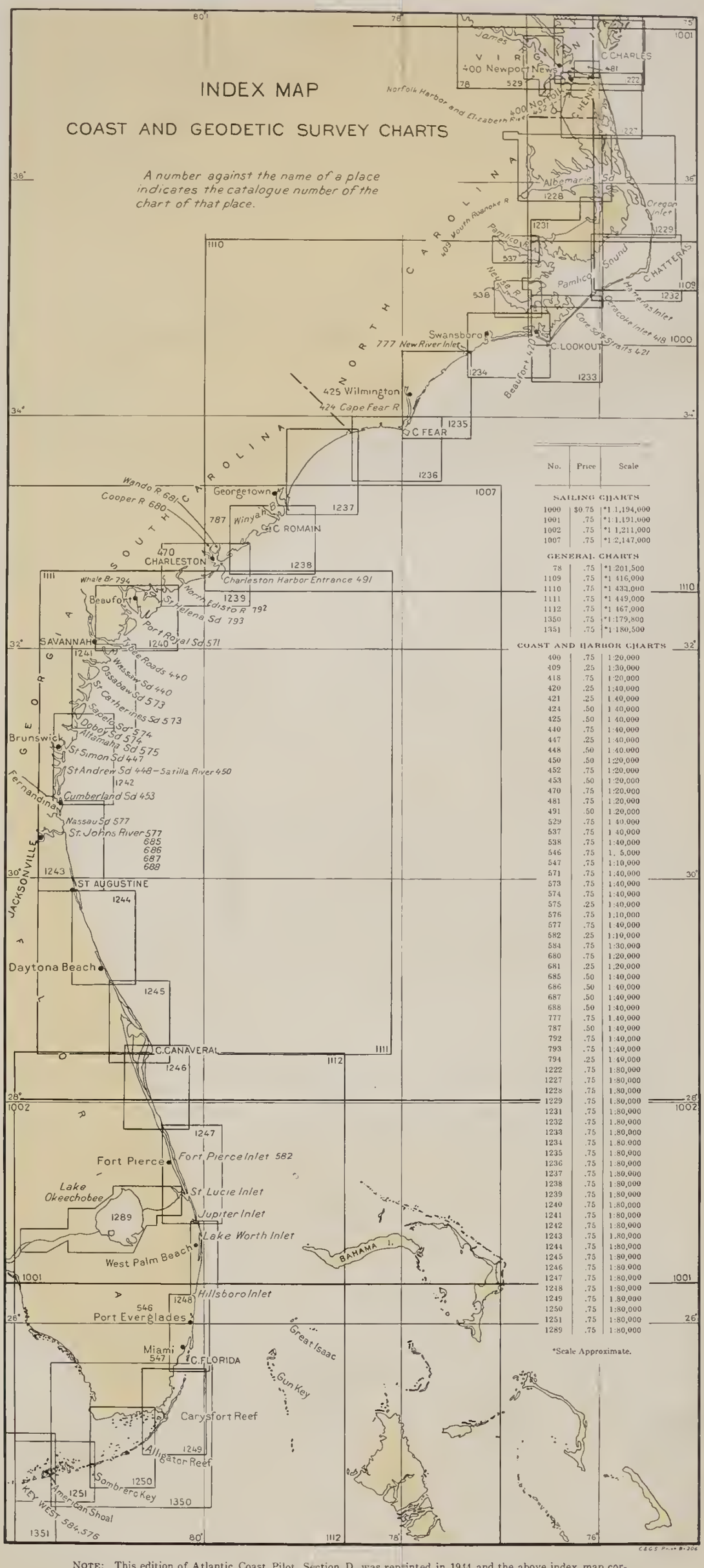
Corrections and additions affecting all Coast Pilot volumes are included in Notice to Mariners, published weekly by the United States Department of Commerce. The aids to navigation mentioned in this pilot are those effective, according to the latest available information, on February 28, 1936.

A supplement, giving the more important changes to the text, is issued about a year after a Coast Pilot volume is published, and again at approximately yearly intervals thereafter until a revised edition appears. Each supplement is complete in itself and cancels all previous issues. The date of the latest supplement to each Coast Pilot is given in the List of Coast Pilots published quarterly in Notice to Mariners.

In using this volume reference should be made to the latest Supplement and to Notices to Mariners issued subsequent to the volume or supplement, and due regard should be given to the possibility of changes having occurred since the date of the latest of these publications. The supplement may be obtained, free of charge upon application to the United States Coast and Geodetic Survey, Washington, D. C., or to any of its field stations.

This edition was prepared by Lt. Earle A. Deily, United States Coast and Geodetic Survey, under the direction of Comdr. F. B. T. Siems, chief, coast pilot section. The United States Lighthouse Service, the United States Engineers, and other authorities all cooperated in furnishing information.

February 28, 1936. R. S. Patton, *Director.*



No.	Price	Scale
SAILING CHARTS		
1000	$0.75	*1:1,194,000
1001	.75	*1:1,191,000
1002	.75	*1:1,211,000
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GENERAL CHARTS		
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1109	.75	*1:416,000
1110	.75	*1:433,000
1111	.75	*1:449,000
1112	.75	*1:467,000
1350	.75	*1:179,800
1351	.75	*1:180,500
COAST AND HARBOR CHARTS		
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409	.25	1:30,000
418	.75	1:20,000
420	.25	1:40,000
421	.25	1:40,000
424	.50	1:40,000
425	.50	1:40,000
440	.75	1:40,000
447	.25	1:40,000
448	.50	1:40,000
450	.50	1:20,000
452	.75	1:20,000
453	.50	1:20,000
470	.75	1:20,000
481	.75	1:20,000
491	.50	1:20,000
529	.75	1:40,000
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546	.75	1:5,000
547	.75	1:10,000
571	.75	1:40,000
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576	.75	1:10,000
577	.75	1:40,000
582	.25	1:10,000
584	.75	1:30,000
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687	.50	1:40,000
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1242	.75	1:80,000
1243	.75	1:80,000
1244	.75	1:80,000
1245	.75	1:80,000
1246	.75	1:80,000
1247	.75	1:80,000
1248	.75	1:80,000
1249	.75	1:80,000
1250	.75	1:80,000
1251	.75	1:80,000
1289	.75	1:80,000

*Scale Approximate.

C&GS Print 8-306

NOTE: This edition of Atlantic Coast Pilot, Section D, was reprinted in 1944 and the above index map corrected to date. No corrections were made in the text of the pilot for charts that have been cancelled or for new charts published. Consequently, when reading the various descriptions, reference should be made to this map rather than to the chart numbers appearing in the text.

UNITED STATES COAST PILOT

ATLANTIC COAST—SECTION D—CAPE HENRY TO KEY WEST

The courses and bearings given in degrees are *true*, reading clockwise from 0° at north to 359°, and are followed by the corresponding *magnetic* course in points, in parentheses. General directions, such as northeastward, west-southwestward, etc., are magnetic.

Distances are in *nautical miles* and may be converted approximately to statute miles by adding 15 percent to the distances given.

Currents are expressed in knots, which are nautical miles per hour.

Except where otherwise stated, all depths are at *mean low water*.

In accordance with the desire of the International Hydrographic Bureau, each depth is followed in parentheses by its equivalent in meters.

Heights are given in feet with metric equivalent in parentheses.

Use this Coast Pilot with reference to the latest Supplement that may have been published and the Notices to Mariners issued after the date of the edition of this pilot or of the Supplement.

1. GENERAL INFORMATION

THE COAST

The information contained in this volume relates to the Atlantic coast from Cape Henry to Key West, a distance of over 1,000 miles, embracing the coasts of a part of Virginia, North Carolina, South Carolina, Georgia, and Florida.

From Cape Henry to Cape Florida the general character of the coast is low and sandy, backed by woods. The highest points of land near the coast southward of Cape Henry are Engagement Hill, elevation 66 feet (20.1 m) on Bodie Island in North Carolina, and Mount Cornelia, elevation 63 feet (19.2 m), just northward of the entrance of St. Johns River in Florida. The principal harbors lie between Cape Lookout and the St. Johns River, the stretches of the coast northward and southward of these limits being broken only by a number of unimportant inlets.

Between Winyah Bay and the St. Johns River the shore is very broken, the harbors, inlets, and sounds being in many cases but little over 10 miles apart. This part of the coast has shoals which extend from 3 to 8 miles offshore. Cape Hatteras, Cape Lookout, Cape Fear, Cape Romain, and Cape Canaveral are well known to navigators familiar with this section of the coast because of the dangerous shoal areas extending seaward from them. These shoals are generally sand, shifting to some extent with every heavy gale; with the strong currents which are found at times, they form the greatest danger for the navigator while passing along the coast.

From Cape Florida to Key West the coast is formed by a chain of small islands, known as the "Florida Keys", off and nearly parallel to which are the Florida Reefs. The keys and reefs are of sand, shell, and coral formation. Rocky coral patches are found in places along the Florida coast southward from Miami. The harbors along this stretch of coast are Miami and Key West, and there are a few anchorages among the keys and reefs.

South of latitude 27°24′ N., and lying at a least distance of 42 miles eastward of the coast of Florida, are Great and Little Bahama Banks and the Bahama Islands; and southward of the Florida Reefs, at a least distance of 78 miles, is the island of Cuba. North and west of these islands and skirting the coast of Florida are the Straits of Florida, through which flow the waters of the Gulf Stream. The straits, in connection with the channels between the islands, form the northern approach and entrance to the Gulf of Mexico.

HARBORS AND PORTS, REPAIRS, HOLIDAYS, DISTANCES, ETC.

Harbors.—Southward of Cape Henry the more important harbors, either commercially or as places of refuge, are Lookout Bight, Beaufort Harbor (N. C.), Cape Fear River, Winyah Bay, Charles-

ton Harbor, Port Royal, Tybee Roads, and Savannah River, Sapelo Sound, St. Simon Sound, Cumberland Sound, St. Johns River and Jacksonville, Port of Fort Pierce (Fort Pierce Inlet), Port of Palm Beach (Lake Worth Inlet), Port Everglades, Miami, and Key West.

Harbor entrances.—The entrance of every harbor on this stretch of the coast is more or less obstructed by a shifting sand bar over which the channel depth is changeable. The channels of the entrances to the larger and more important harbors are being improved by dredging, and in some cases by jetties which extend from both sides of the entrance seaward to deep water outside of the bars. At the improved entrances more dependence can be placed on the channel depths, as given in this volume, than on the bars of the harbors not under improvement. Masters of vessels bound to the harbors along this coast should, in cases where the given depths approximate the draft of their vessel, inquire of local pilots what draft is being taken in and out over the bar at that time.

On the bars not under improvement the buoys are moved from time to time to indicate the channel; but they are liable to be dragged out of position and cannot always be immediately replaced, so that a stranger must use the greatest caution. A stranger should, if possible, select a rising tide for entering any of the harbors on this coast.

The tidal currents have considerable velocity in all of the entrances, and their direction is affected by the force and direction of the wind; sailing vessels entering the harbors and sounds require a fair working breeze during the ebb.

In easterly gales the sea breaks on most of the bars, and no stranger should then attempt to enter such harbors without the assistance of a pilot.

Supplies.—Coal can be obtained at Newport News, Norfolk, Beaufort (N. C.), Wilmington, Charleston, Port Royal, Savannah, Jacksonville, and Miami (advance notice is necessary in order to procure coal in any but limited quantities at Port Royal and Miami); fuel oil at the places named, excepting Beaufort and Port Royal. Water provisions, ship-chandler's stores, and gasoline can be had at the above cities and at all towns. Diesel oil can be secured at the larger cities.

Repairs.—Newport News, Norfolk, Charleston, Savannah, and Jacksonville are the principal places at which extensive repairs to the hulls of vessels and machinery of steamers can be made. There are limited facilities for repairs at Elizabeth City, Washington (N. C.), New Bern, Wilmington, Georgetown, Brunswick, and Key West. Minor repairs can be made and small craft can be hauled out at several other places.

Port facilities.—The facilities available for the handling and storage of cargo are described under the various ports.

Largest dry docks and marine railways

Port	Name	Length over blocks	Depth on sill at high water	Capacity
		Feet	*Feet*	*Tons*
Newport News, Va	Dry dock	738	30	
Norfolk, Va	Dry dock (Government)	1,011	40	
	Floating dock	310	17	4,000
	Railway	410	14–18	4,600
Elizabeth City, N. C	do	205	5–10	800
Washington, N. C	do	50		
New Bern, N. C	do	75		100
Wilmington, N. C	do	350	18	1,000
Georgetown, S. C	do	90	5–7	100
Charleston, S. C	Dry dock (Government)	503	34	
	Floating dock	444	22½	10,000
Savannah, Ga	Railway	225	20	1,200
Brunswick, Ga	do	125	7–12	900
Jacksonville, Fla	Floating dock	350		5,000
	Railway	150		1,000
Miami, Fla	do	185	12	1,500
Key West, Fla	do	176	16	1,000

Legal holidays.—The following are legal holidays in the States of North Carolina, South Carolina, Georgia, and Florida:

January 1, New Year's Day.
January 19, Lee's Birthday.
February 22, Washington's Birthday.
April 12, Halifax Resolutions (North Carolina only).
May 10, Confederate Memorial Day (North Carolina only).
May 20, Mecklenburg Declaration of Independence (North Carolina only).
July 4, Independence Day.
September (first Monday), Labor Day.
November (first Tuesday after first Monday), election day (except in Georgia).
November 11, Armistice Day (except in Georgia).
November (last Thursday), Thanksgiving Day.
December 25, Christmas Day.
Sundays (when a legal holiday falls on Sunday, the following Monday is observed).

In the ports described in this volume stevedores are not prohibited by law, union rules, or other regulations from working ships on holidays, and it is possible to make arrangements in advance for work on such days. In most cases workmen receive extra pay for work on holidays, in accordance with rates fixed by agreement between the labor unions and ship operators.

Communication is by regular lines of coasting steamers, by rail, by airplane, and by telephone, telegraph, and radio. There are lines of trans-Atlantic steamers operating from the larger ports, and railroad connections between the coastal cities and all parts of the country. The highway connections between the ports are excellent. There is direct airplane service between the more important cities, and between Miami and the Bahama Islands, Habana, and South America.

Distances between ports.—The attention of mariners is called to the Coast and Geodetic Survey publication "Distances Between United States Ports, Serial No. 444", which may be secured from the agen-

cies of the service at the various ports and from the Superintendent of Documents, Washington, D. C. (price 10 cents).

The tables of distances contained therein have been compiled for the purpose of giving, in condensed and convenient form, distances between ports of the United States and its off-lying territories. For ready reference and for use in combining these tables with those issued by other nations, a number of distances from the United States to foreign ports are also included.

The table of distances given on page 6 contains the more important ports on the Atlantic seaboard southward of New York.

Table of distances

	Key West	Miami	Port Everglades	Port of Palm Beach	Port of Fort Pierce	Jacksonville	Fernandina	Brunswick	Savannah	Beaufort	Charleston	Georgetown	Wilmington	Norfolk	Baltimore	Philadelphia
New York (Battery)	1,121	982	961	916	903	788	757	746	702	691	629	592	559	287	410	231
Philadelphia	1,089	950	928	884	870	756	725	714	670	659	597	560	527	251	381	
Baltimore	1,044	905	881	839	823	711	680	669	625	614	552	515	482	171		
Norfolk	918	779	757	713	699	585	554	543	499	488	426	389	356			
Wilmington, N. C	700	561	537	495	456	317	286	275	225	216	151	107				
Georgetown	630	491	467	425	385	246	215	204	153	144	80					
Charleston	584	445	421	379	337	198	165	151	98	89						
Beaufort, S. C	554	415	391	349	309	163	128	115	63							
Savannah	543	404	380	338	297	145	108	98								
Brunswick, Ga	488	349	325	283	242	80	43									
Fernandina	463	324	300	258	217	52										
Jacksonville	463	324	300	258	216											
Port of Fort Pierce	259	120	96	54												
Port of Palm Beach	210	70	47													
Port Everglades	169	28														
Miami	151															

NOTE.—Distances are in nautical miles. Those from ports north of Cape Hatteras to ports south of Jacksonville are along the outside route (outside the Gulf Stream between Cape Hatteras and Jupiter) recommended in this volume. Distances between ports south of Cape Hatteras are along the routes inside the Gulf Stream recommended in this volume.

PILOTS AND PILOTAGE

Pilots cruise off Charleston Harbor and Savannah River entrances. At other ports pilots will come out upon previous notice by radio or otherwise or on vessels making signals for a pilot.

Pilotage is compulsory for certain vessels entering from sea but is not compulsory for the interior waters inside the inlets. Pilots for parts of the inside route are obtained at the larger cities and towns along the route. Pilot stations and rates of pilotage are given in the information concerning the various ports. In general, the charge for piloting in interior waters is by special agreement with the pilot.

Harbor masters are appointed for the principal ports, and they have charge of the anchorage and berthing of vessels in their respective harbors. For harbor masters' fees, see information concerning the various ports. The laws prohibit the dumping of ashes or other materials in the channels.

Towboats are stationed at Cape Fear River, Winyah Bay, Charleston Harbor, Savannah River, St. Simon Sound (Brunswick), St. Johns River, Miami, and Key West.

Salvage equipment.—Tugs, lighters, and diving apparatus are available at Wilmington, Charleston, Savannah, Miami, and Key West for limited wrecking and salvaging operations. Equipment for extensive operations can be secured at Norfolk and Jacksonville.

QUARANTINE AND MARINE HOSPITALS

Quarantine for all ports within the limits of this volume is enforced in accordance with the regulations of the United States Public Health Service.

National quaratine regulations will be found at the stations of the service and at American consulates, or will be furnished to vessels upon application, either by officers of the service or by the United States Public Health Service, Washington, D. C. Every vessel should be provided with the quarantine regulations.

The folowing are the quarantine boarding stations within the limits covered by this volume:

Cape Charles, Va.,[1] address, Quarantine, Fort Monroe, Va.; boarding and inspection station, Fort Monroe (Old Point Comfort), Va.
Washington, N. C.
Cape Fear (Southport), N. C.[1]
Charleston, S. C.[1]
Georgetown (South Island), S. C.
Beaufort, S. C.
Savannah, Ga.[1]
Brunswick, Ga.[1]
Cumberland Sound (Fernandina), Fla.[1]
Jacksonville, Fla.[1]
Fort Pierce, Fla.
West Palm Beach, Fla.
Fort Lauderdale, Fla.
Miami, Fla.[1]
Key West, Fla.[1]

Medical relief.—American merchant seamen are entitled to free medical relief at the expense of the Government, through the United States Public Health Service at its established relief stations. A list of such stations in the region covered by this volume is given below.

An American merchant seaman is one "engaged on board in the care, preservation, or navigation of any registered, enrolled, or li-

[1] Fumigation facilities at these ports.

censed vessel of the United States, or in the service, on board, of those engaged in such care, preservation, or navigation."

Free medical advice is furnished to seamen by radio. (See Radio Service, page 24.

Relief stations of the Public Health Service are located at the addresses given, in the following ports:

Marine hospitals:

Norfolk, Va.
Savannah, Ga.
Key West, Fla.

Relief station, second class:

Miami, Fla.

Relief stations, third class (in charge of medical officer):

Elizabeth City, N. C.
Edenton, N. C.
Washington, N. C.
Newbern, N. C.
Beaufort, N. C.
Morehead City, N. C.
Southport, N. C.
Wilmington, N. C.
Georgetown, S. C.
Charleston, S. C.
Brunswick, Ga.
Jacksonville, Fla.

AIDS TO NAVIGATION, UNITED STATES LIGHTHOUSE SERVICE

The lighthouses, lightships, radiobeacons, radio direction-finder stations, and other aids to navigation are the principal guides and mark the approaches and channels to the important ports. The buoyage is in accordance with the system adopted by the United States and is described below. The principal coast lights and the lightships are described in the text of this volume. All lightships and some light stations are equipped with radiobeacons and distance-finding apparatus. A list of the radiobeacons and the radio direction-finder stations operated by the United States Navy in the area covered by this volume is given under the heading "Radio Service." Descriptions of all aids to navigation will be found in the publications of the United States Lighthouse Service listed in the appendix under "Publications."

Private aids to navigation, such as stakes and small floats, are not supervised by the Government, and are therefore not listed or indicated on the charts. When private aids are established similar to those maintained by the Government they must be authorized by the United States Light house Service.

System of buoyage.—The United States Lighthouse Service observes the following order in coloring and numbering buoys in the United States waters, viz:

In approaching the channel, etc., from seaward, *red buoys*, with *even* numbers, will be found on the *starboard side*.

In approaching the channel, etc., from seaward, *black buoys*, with *odd* numbers, will be found on the *port side*.

Buoys painted with *horizontal bands* (red and black or black and red) will be found where channel ways lie on either side of them. In general, these buoys have no distinctive shape, but when it is desired to indicate the main or preferred channel, a *can buoy with black band at the top* is used when the important channel is to the *right* for the entering vessel, and a *nun buoy with red band at the top* when the important channel is to the *left*.

Buoys painted with *white and black perpendicular stripes* will be found in the *middle* of a fairway and they may be passed close-to.

Offshore buoys along the Atlantic Coast are colored and numbered from north to south, and along the Pacific Coast from south to north, conforming to the order of Light Lists; this does not apply to outside buoys which have a definite approach signification, and which are colored and numbered to conform to the approach. In channels not having a definite approach charac-

ter, buoys are colored and numbered from north to south or from east to west on the Atlantic Coast and from south to north or from west to east on the Pacific Coast.

All other distinguishing marks on buoys are in addition to the foregoing and may be to mark particular spots. A description of such marks is given in the Light Lists.

Nun buoys, red and properly numbered, are usually placed on the *starboard* side and *can buoys, black* and properly numbered, on the *port* side of the channels.

Day beacons (except such as are on the sides of channels, which will be colored like buoys) are constructed and distinguished with special reference to each locality, and particularly in regard to the background upon which they are projected.

Buoys maintained by the United States Army Engineers for dredging purposes are painted white with the top, for a distance of 2 feet, painted dark green.

Significance of light characteristics

A system of four characteristics of flashes is used on lighted buoys to distinguish their principal purposes, corresponding in part to the color distinctions that are made in buoys for use by day.

Characteristic of flashing	Purposes indicated	Color of light	Color of buoy
1. *Quick flashing.*[1]—Not less than 60 flashes per minute.	Isolated dangers, junctions, bifurcations, sharp turns in channels, narrow entrances.	White Green Red	Red and black, black and red, black, or red. Black and red, or black. Red and black or red.
2. *Interrupted quick flashing.*[1]—Same speed as the preceding but with dark intervals of about 4 seconds.	Wrecks	White Green Red	Red and black, black and red, black, or red. Black and red, or black. Red and black, or red.
3. *Short-long flashes.*—Groups of a short and a long flash. Groups repeated about 8 times per minute.	Midchannels and fairways.	White	Black and white vertical stripes.
4. *Slow flashing or flashing.*—Not more than 30 light periods per minute.	Channels sides and coasts.	White Green Red	Red or black. Black. Red.

[1] The first 2 characteristics (quick flashing) are shown on lighted buoys marking features requiring particular attention.

For a complete description of the significance of colors, shapes, and numbers of buoys and the characteristics of lights used on lighted buoys, see the introduction to the Light Lists published by the United States Lighthouse Service.

Defects in aids to navigation.—Aids to navigation are protected by law, and mariners in their own interest should use every precaution to avoid collisions with them. Mariners are requested to report defects in the aids to navigation direct to the Superintendent of Lighthouses of the district concerned by commercial radio, by radio communication with lightships, or other prompt means.

Suggestions as to aids to navigation.—Mariners are also invited to send suggestions as to improvements or changes in aids to navigation directly to the Superintendents of Lighthouses, as listed below, or to confer with them, or to address the Commissioner of Lighthouses, Washington, D. C.

Dangers, changes in channels, shoals, etc.—Mariners are requested to send important facts affecting the charts or other publications of the Coast and Geodetic Survey promptly to the Director of the Coast

and Geodetic Survey, Washington, D. C., or to the nearest Coast and Geodetic Survey field station. The field stations are listed in the appendix of this volume.

Communication with outlying lightships.—All lightships and stations having radio communication facilities observe watch on 500 kilocycles during the first 15 minutes of each hour from 8 a. m. to 8:15 p. m. standard time for radiotelegraph communication. Information of importance in the maintainance of aids to navigation or other urgent matters from vessels may be transmitted at such times. Should the radiobeacon be in operation for regular schedule, fog, or thick weather, it will not be interrupted for such communication except in matters of extreme urgency. Calling and brief communication can be carried on during the silent periods of the radiobeacons. (See Light and Buoy Lists, United States Lighthouse Service, for signal characteristics and operating times.)

The district offices of the Lighthouse Service in the area covered by this publication are:

Norfolk, Va.; Superintendent of Lighthouses, *Fifth District.*—Includes the waters of Maryland, Virginia, and North Carolina from Fenwick Island Light Station to and including New River Inlet.

Charleston, S. C.; Superintendent of Lighthouses, *Sixth District.*—Includes the waters of North Carolina, South Carolina, Georgia, and Florida, from New River Inlet to Hillsboro Inlet Light Station.

Key West, Fla.; Superintendent of Lighthouses, *Seventh District.*—Includes the waters of Florida from Hillsboro Inlet Light Station to Suwanee River.

Notice to Mariners, showing changes in aids to navigation and issued weekly, will be mailed free to mariners who apply to the Superintendents of Lighthouses as above, or single copies may be obtained or consulted at the offices of the Superintendents of Lighthouses, or the Coast and Geodetic Survey Field Stations, or other agencies distributing marine information.

Radio broadcasts.—The United States Lighthouse Service makes official announcement from time to time of the more important Notice to Mariners data, covering the establishment of new aids to navigation, changes in existing aids, or emergency happenings relating to aids to navigation which shipping interests should receive without delay.

Broadcast announcements are preceded by the introductory words, "Lighthouse Services—Notice to Mariners" and are concluded by a signature as "Lighthouse Superintendent Norfolk" and are transmitted by the Naval Radio Stations and the Tidewater Wireless Telegraph Stations at the time and on the frequency designated. Emergency broadcasts announcing unusual happenings are made at any time using the 500-kilocycle frequency. Lighthouse Tenders also make emergency broadcasts in this manner when necessity therefor occurs.

These radio broadcasts are supplemental to those of the United States Hydrographic Office and other established means of disseminating Notices to Mariners and are not in lieu thereof.

Determination of compass error by the use of navigational ranges.—Navigational ranges provide a convenient means of determining

compass error for the headings along the ranges when a vessel is entering and leaving a port or harbor. However, extreme caution should be exercised in the matter. Definite information as to the correct azimuth of any particular range is absolutely necessary; also, the permanency of the range should be taken into consideration.

The azimuths of channel ranges, which have been determined with sufficient accuracy for compass error determination, will be indicated in degrees and minutes in the Light Lists and in the Notice to Mariners. Azimuths given only in degrees should not be used for this purpose.

Channel ranges that are subject to changes in location may lead to serious misinformation if used for the determination of the compass error. If a change has taken place the exact data relating to the change in azimuth may not be made immediately available in notices to mariners or otherwise.

It is not considered good practice to derive the azimuth of a channel range from the chart. The scale of the chart and other considerations will usually prevent cartographic plotting of the azimuths to a degree of accuracy desired for the purpose of determining compass error. Furthermore, the chart may not show the latest known positions of the objects of the range (this will not affect the safe navigation of the channel, if the vessel follows the existing range beacons actually marking the channel).

Along short reaches of channel ranges, sufficient time may not be available for the requisite steadying of the compass along the course of the range, and this will cause inaccuracies in observing for compass error.

Where a known area of local magnetic attraction would interfere with such use of ranges a note describing this local attraction will be found on the chart.

THE UNITED STATES HYDROGRAPHIC OFFICE

The Hydrographic Office of the United States Navy Department exists for the improvement of the means for navigating safely the vessels of the United States Navy and of the mercantile marine by providing accurate and cheap nautical charts, sailing directions, navigators, and manuals of instruction for the use of all vessels of the United States, and for the benefit and use of navigators generally.

The attention of mariners is called to the various Hydrographic Office publications of navigational interest listed under "Publications" in the appendix of this volume.

The charts and coast pilots pertaining to the territorial waters of the United States and its possessions are published by the United States Coast and Geodetic Survey.

Branch Hydrographic Offices maintained at the various cities within the area covered by this volume are located as follows:

Norfolk, Va., Room 16, Customhouse. Savannah, Ga., First floor, Customhouse.

In conjunction with these offices the United States Coast Guard assists the Hydrographic Office in its service and the captain of the port, customhouse wharf, Charleston, S. C., performs some of the duties of a branch office.

THE UNITED STATES ENGINEERS

The improvement of the rivers and harbors of the United States and miscellaneous civil works are under the charge of the Corps of Engineers, United States Army.

The miscellaneous civil works under the Corps of Engineers include the administration of the Federal laws enacted for the protection and preservation of navigable waters of the United States governing the establishment of regulations for the use, administration, and navigation of navigable waters, the approval of plans of bridges, the alteration of obstructive bridges, the establishment of anchorage grounds and harbor lines, the removal of sunken vessels obstructing or endangering navigation, the granting of permits for structures or operations in navigable waters, etc.

The attention of navigators is called to the various publications of the United States Engineers relative to matters of nautical interest which are listed under "Publications" in the appendix of this volume.

The area with which this Coast Pilot is concerned lies entirely within the South Atlantic Division of the United States Engineers. A list of the district offices and their location in this division is given below:

Norfolk District, foot of Front Street, Norfolk, Va.
Wilmington District, 308 Custom House, Wilmington, N. C.
Charleston District, 33 Custom House, Charleston, S. C.
Savannah District, Post Office Building, Savannah, Ga.
Jacksonville District, U. S. Courthouse and Post Office Building, Jacksonville, Fla.

Information concerning the various ports, improvements, channel depths, navigable waters, and the condition of the intracoastal waterway in the areas under their jurisdiction may be obtained direct from the District Engineer Offices.

THE UNITED STATES BUREAU OF NAVIGATION AND STEAMBOAT INSPECTION

The Bureau of Navigation and Steamboat Inspection under the Department of Commerce is charged with general supervision of the commercial marine and merchant seamen of the United States, except so far as supervision is lodged with other offices of the Government.

In addition to various other duties, the Bureau is especially charged with the decision of all questions relating to the issuing of registers, enrollments, and licenses of vessels; investigates the operation of laws relative to navigation; is charged with the enforcement and investigation of violations of the navigation and steamboat inspection laws; and is charged with the duty of inspecting vessels, the licensing of the officers of vessels, and the administration of the laws relating to such vessels and their officers for the protection of life and property. The Bureau certificates the able seamen who form the crew of merchant vessels, and the inspectors of the Service, together with other Government officers, especially detailed for that purpose, also certificate the lifeboat men.

For administrative purpose the supervising inspectors of the Service maintain 11 district offices, and local inspectors have offices in the more important cities having maritime interests.

THE UNITED STATES COAST GUARD

The United States Coast Guard is a military branch of the Government maintained for the purpose of enforcing the navigation and other maritime laws under the jurisdiction of the United States, rendering of assistance to vessels in distress, saving life and property, destroying derelicts and removing obstructions and menaces to navigation. These duties include the International Ice Patrol, the Bering Sea Patrol, flood relief work, patrol of regattas and marine parades, and rendering medical relief to deep-sea fishermen and to the natives of Alaska.

The Coast Guard makes no charge for its services to vessels in distress and will respond promptly to all proper requests for assistance so far as the distribution and condition of its facilities will permit. However, it is not the purpose of the Coast Guard to compete or interfere with commercial enterprise in ordinary towing and salvage operations, but to confine its assistance activities to cases of actual or potential distress.

Radio-equipped vessels requiring assistance may obtain the services of the Coast Guard by transmitting a request on the international distress and calling frequency, 500 kilocycles (410 kilocycles on the Great Lakes), to "Any Coast Guard Unit" (radio call NCU), or to any shore radio station addressed to "Coast Guard." Shore radio stations will forward to the Coast Guard all information regarding vessels requiring assistance unless such information is contained in a message specifically addressed elsewhere.

If the following information is included in the original request for assistance it will place the responsible Coast Guard officer in a position to determine immediately the types and number of vessels required to render adequate aid; thus greatly facilitating the work of the Coast Guard and avoiding any unnecessary delay in the dispatching of assistance.

1. Name, type, and nationality of vessel.
2. Position, course, and speed (including drift).
3. Nature of trouble and condition of vessel, sea, and wind.
4. Number of persons on board.
5. State whether or not Coast Guard assistance is required.

The procedure recommended to be followed by vessels intercepting a distress signal to avoid distress-signal interference is outlined under "Radio Service", page 17.

Coast Guard stations and houses of refuge are maintained at the places named in the table following. The active stations are fully manned throughout the year and are supplied with boats, wreck guns, beach apparatus, and all other appliances for affording assistance in case of shipwreck. Instructions to enable mariners to avail themselves fully of the assistance thus afforded will be found in the appendix, page 310.

The Coast Guard stations are provided with the International Code Signals and are prepared to send or receive signals in that code or by means of the Semaphore Code, the Occulting or Flashing-light Code, or the International Morse Wigwag Code. Telephone facilities are available at the stations for the summoning of Coast

Guard cutters, tugs, or other assistance, or for communicating with telegraph lines.

The houses of refuge on the coast of Florida are in charge of a keeper and are supplied with boats, provisions, and restoratives.

Coast Guard stations and houses of refuge

Number	Name of station	State	Locality
161	Cape Henry	Va	¾ mile southeast of lighthouse.
162	Virginia Beach	Va	5 miles south of Cape Henry Light.
*163	Dam Neck Mills [1]	Va	9 miles south of Cape Henry Light.
164	Little Island	Va	On beach abreast of North Bay.
165	False Cape	Va	On beach abreast of Back Bay.
166	Wash Woods	N. C	On beach abreast of Knotts Island.
*167	Pennys Hill	N. C	5¾ miles north of Currituck Beach Light.
168	Currituck Beach	N. C	½ mile south of Currituck Beach Light.
170	Caffeys Inlet	N. C	9½ miles south of Currituck Beach Light.
171	Paul Gamiels Hill	N. C	4½ miles north of Kitty Hawk.
*172	Kitty Hawk	N. C	On the beach abreast of north end of Kitty Hawk Bay
173	Kill Devil Hills	N. C	4 miles south of Kitty Hawk.
174	Nags Head	N. C	8 miles north of Oregon Inlet.
175	Bodie Island	N. C	¾ mile northeast of Bodie Island Light.
176	Oregon Inlet	N. C	1¼ miles south of Oregon Inlet.
177	Pea Island	N. C	3 miles north of New Inlet.
179	Chicamacomico	N. C	4 miles south of New Inlet.
*180	Gull Shoal	N. C	10 miles south of New Inlet.
181	Little Kinnakeet	N. C	10 miles north of Cape Hatteras Light.
182	Big Kinnakeet	N. C	5 miles north of Cape Hatteras Light.
183	Cape Hatteras	N. C	1 mile south of the lighthouse.
184	Creeds Hill	N. C	6 miles westward of Cape Hatteras Light Station.
*185	Durants	N. C	On the beach abreast of Sandy Bay, about 3½ miles east of Hatteras Inlet.
186	Hatteras Inlet	N. C	1 mile west of Hatteras Inlet.
187	Ocracoke	N. C	2½ miles northeast of Ocracoke Inlet.
188	Portsmouth	N. C	Northeast end of Portsmouth Island.
189	Core Bank	N. C	Halfway between Ocracoke Inlet and Cape Lookout.
190	Cape Lookout	N. C	1½ miles south of the lighthouse.
191	Fort Macon	N. C	Beaufort entrance, ¼ mile north of fort.
192	Bogue Inlet	N. C	½ mile east of inlet.
193	Cape Fear	N. C	On Smith Island, Cape Fear.
194	Oak Island	N. C	West side mouth of Cape Fear River.
196	Sullivans Island	S. C	Moultrieville, Sullivans Island, at north end of harbor jetty.
202	Bulow [2]	Fla	17½ miles south of Matanzas Inlet.
203	Mosquito Lagoon [2]	Fla	On beach outside the lagoon.
204	Chester Shoal [2]	Fla	9½ miles north of Cape Canaveral.
205	Bethel Creek [2]	Fla	9½ miles north of Indian River Inlet.
206	Indian River Inlet [2]	Fla	South side of inlet.
207	Gilberts Bar [2]	Fla	St. Lucie Rocks, 2 miles north of St. Lucie Inlet.
208	Fort Lauderdale [2]	Fla	North side of New River Inlet.
209	Biscayne Bay [2]	Fla	4¼ miles north of Miami entrance.

[1] Princess Anne C. G. Radio Station.
[2] House of refuge.
* Discontinued as active unit. Two men on station as caretakers.

NOTE.—Station numbers are for aviation use only.

Coast Guard administrative offices are located as follows:

Boston, Mass	Customhouse.
New York, N. Y	Customhouse.
Washington, D. C	Wilkins Building.
Norfolk, Va	Customhouse.
Jacksonville, Fla	Federal Building.
Mobile, Ala	Customhouse.

The telegraphic and radio addresses are "Coast Guard, Boston", "Coast Guard, New York", etc.

Air stations.—Coast Guard stations with facilities for rendering assistance by airplane are maintained at Cape May, N. J., and at Miami, Fla.

RADIO SERVICES

The supervision of radio communication in the United States, including the Hawaiian Islands, is controlled by the Federal Communications Commission. Twice a month, the Commission issues a **Radio Service Bulletin**, giving those current corrections to the international Berne publications that affect radio services of the United States. These publications are listed below. Interested parties can secure copies of this bulletin by addressing the Commission at Washington, D. C. At the present time this is the only publication of the Commission.

The **Rules and Regulations** of the former Federal Radio Commission are remaining in effect until such time as superseding regulations are promulgated by the present Commission. Changes in these **Rules and Regulations** are included in the above **Radio Service Bulletin.**

With the exception of the above **Radio Service Bulletin**, all radio information available from the Commission is incorporated into the publications of the International Bureau of the Telecommunication Union of Berne, Switzerland. They are published every six months. Editions in English can be secured by sending remittance direct to the Bureau. The list of these publications is given below.

These Berne publications show name of station and owner or operator, geographical locations, call, frequencies, type of emission, power, hours of service, and rates.

LIST OF BERNE PUBLICATIONS

1. List of Frequencies and Supplements, 40 Swiss gold francs, including postage.
2. List of Coast Stations and Ship Station, 3.60 Swiss gold francs, including postage.
3. List of Aircraft and Aeronautical Stations, 2.60 Swiss gold francs, including postage.
4. List of Broadcasting Stations and Supplements, 3.70 Swiss gold francs, including postage.
5. List of Stations Performing Special Services and Supplements, 5.50 Swiss gold francs, including postage.
6. List of Call Letters of Fixed, Land, and Mobile Stations and Supplements, 9.30 Swiss gold francs, including postage.

Remittance should be made by international money order to the International Bureau of the Telecommunication Union, Berne, Switzerland.

Comprehensive information regarding international radio services can also be obtained from the **Hydrographic Office Publication No. 205, Radio Aids to Navigation**, which can be secured from the Hydrographic Office, Navy Department, Washington, D. C., price $1.50. This publication lists radio stations throughout the world which perform services of value to navigation. It includes details of radio time signals, radio direction-finder stations, radiobeacon stations, radio weather bulletins, storm and naviagtional warnings, medical advice by radio, distress and emergency traffic, etc. Additions and changes to this publication are issued weekly in the Hydrographic Office Notice to Mariners, and extracts affecting it will be mailed monthly to those not in receipt of the Notice to Mariners.

Further information regarding any of the radio services noted below can be secured from the above publications.

TIME SIGNALS

Radio time signals are sent daily from the United States radio stations at Arlington, Va. (call letters NAA), and the Navy Yard, Washington, D. C. (call letters NAL).

For the latest information as to time, frequency in kilocycles, and type of emission see H. O. Publ. No. 205, Radio Aids to Navigation, issued by the Hydrographic Office, United States Navy.

As indicated in the table below, the time signal consists of the transmission of dots (·) and the omission (0) of the dots for various seconds preceding the hour signal. The hour signal is the beginning of the transmission of a dash (—) of 1 second duration.

This is followed by the letters VA. In the event of an error occurring in the signal, another time signal will be transmitted 1 hour later.

Hydrographic information, weather reports (see p. 24), and other information of benefit to shipping are sent out from these stations.

Naval radio time signals

Minute interval during preceding hour	Seconds of minute intervals												
	1 to 28	29	30 to 50	51	52	53	54	55	56	57	58	59	60
Min.													
55 to 56	Dot (·)	0	Dot (·)	0	·	·	·	·	0	0	0	0	·
56 to 57	every	0	every	·	0	·	·	·	0	0	0	0	·
57 to 58	second	0	second	·	·	0	·	·	0	0	0	0	·
58 to 59	1 to 28,	0	30 to 50,	·	·	·	0	·	0	0	0	0	·
59 to hour	incl.	0	incl.	0	0	0	0	0	0	0	0	0	—

REQUESTS FOR ASSISTANCE FROM VESSELS IN DISTRESS

Vessels calling for the assistance of the United States Coast Guard are recommended to use the procedure as outlined under the subdivision of this volume headed "United States Coast Guard". (See p. 13.)

Distress and urgent signals.—The international radio distress signal SOS indicates that a ship, aircraft, or other mobile station sending it, is threatened by grave and imminent danger, and requests immediate assistance. Many cases occur when the degree of danger is such as not to warrant the use of the SOS signal but assistance is required. The international urgent signal XXX has been provided for those cases to indicate that the calling ship has a very urgent message to transmit concerning the safety of the ship; of a ship in sight; or of the safety of any person on board or in sight therefrom. Shipmasters are urged to refrain from the use of the SOS signal when the XXX signal will serve the purpose.

A vessel in distress off the coast of the United States requiring assistance should make use of one of the radio signals (SOS or XXX) mentioned above, or the radio call NCU—"any Coast Guard unit"—used in the manner described under United States Coast Guard. A vessel sighting a vessel in distress may send the distress signal SOS, or make a report of the facts by making use of the

urgent signal XXX, or the radio call NCU—"any Coast Guard unit", or by calling direct any commercial or Government radio station which is capable of transmitting on 500 kcs. (600 meters). Any or all of these radio stations will forward the information to the appropriate assisting agencies.

In case of extreme urgency, when an SOS is broadcast, it is requested that the following procedure be followed by the vessel in distress whenever possible. Approximately 10 minutes after the transmission of the original distress message, transmit slowly on the distress frequency, MO and own radio call for three minutes. This will enable Coast Guard vessels and stations in the vicinity to obtain direction-finder bearings and accurately plot the position of the distressed vessel.

A vessel having sent a distress call has started an extensive machinery of rescue, which not only extends to shipping within range but to Government agencies, and perhaps to the suspension of other traffic. So the responsibility devolves on such a ship to keep her position and condition known. Should her trouble become remedied the fact should be immediately broadcast that radio traffic may be cleared and shipping proceed.

Distress signal interference.—The successful expedition of distress traffic requires the adherence of all the operators to the rules of procedure and noninterference. One of the most conspicuous difficulties in handling this traffic is the interference caused by the operator, who, no doubt, is anxious to assist, but by his efforts in trying to persuade another operator to maintain silence, is himself contributing to the confusion. It sometimes happens that several operators are trying to silence an operator that they feel is an offender while they themselves are offenders.

If one vessel is sending when a distress signal is broadcast, it is easier to copy through her interference than add further interference by several vessels trying to stop her.

Procedure in assisting vessels in distress to avoid distress-signal interference.—The United States Coast Guard recommends the following procedure **for vessels intercepting a distress signal:**

1. *Give absolute priority* to distress call and messages relating thereto.
2. *Cease all transmissions* capable of interfering with the conduct of distress communications.
3. Maintain *absolute silence* if within range and not actually taking part in the conduct of distress communications.
4. Concentrate attention on the distress case and *intercept all information possible.*
5. If unquestionably in vicinity of distressed vessel, *acknowledge receipt* of the distress message, if received, *giving your position* to the vessel in distress, stating action being taken.
6. Be extremely careful *not to interfere* with stations more favorably situated to handle the case.
7. Do not try to silence other units, i. e. "QRT", *unless you are in control.*

The vessel in distress controls: Permit him to handle the situation without being interferred with. The vessel in distress may delegate

this control to some other station more favorably situated. Do not interfere with the station lawfully controlling the situation.

RADIOTELEGRAPHIC WEATHER BROADCASTS

Radiotelegraphic broadcasts of weather information, issued daily (Sundays and holidays included) by the United States Weather Bureau for the benefit of marine and aviation interests, are sent out from naval radio stations on the Atlantic coast.

A major marine bulletin, issued twice daily by the United States Weather Bureau is broadcast via Arlington naval radio station NAA and rebroadcasted via San Juan (call letters NAU). The bulletin contains forecasts, warnings, atmospheric pressure distribution and surface weather observations for the regions of the Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea, suitable for preparing weather maps at sea.

Hurricane warnings and advisory messages relating thereto are broadcast whenever issued and repeated hourly for 12 hours if not previously canceled.

For a complete description of this service see United States Hydrographic Office Publication No. 205, *Radio Aids to Navigation*, also United States Weather Bureau Circular No. 1, *Radio;* for decoding the bulletin.

RADIOBEACONS AND DISTANCE FINDING

The United States Lighthouse Service operates a system of radiobeacons established along the United States coasts. This system has recently been coordinated with that of the Lighthouse Administration of Canada in order that the methods of operating the radiobeacon systems of the United States and Canada might become more effective. In order to facilitate the widest utilization of this system of navigational aids, there are issued, at intervals, radiobeacon charts upon which the radiobeacons are shown, with their characteristics and operating schedules. These charts may be obtained free from the offices of the district lighthouse superintendents.

The radiobeacons in or near the area covered by this volume are given in the following table:

Radiobeacons

Station	Latitude north			Longitude west		
	°	′	″	°	′	″
Winter-Quarter Lightship	37	55	25	74	56	22
Chesapeake Lightship [1]	36	58	42	75	42	12
Cape Henry [1]	36	55	35	76	00	27
Diamond Shoal Lightship	35	05	18	75	19	44
Cape Lookout	34	37	22	76	31	29
Frying Pan Shoals Lightship	33	28	00	77	33	45
Charleston (Fort Sumter)	32	45	12	79	52	30
Savannah Lightship	31	56	40	80	39	50
St. Johns Lightship [1]	30	23	30	81	18	00
Cape Canaveral	28	27	37	80	32	37
Jupiter Inlet	26	56	54	80	04	56
Fowey Rocks	25	35	25	80	05	49
Dry Tortugas	24	37	59	82	55	12

[1] Equipped for distance finding, see p. 19.

For details as to frequencies, geographic positions, signals, and thick and clear weather transmission, see the "Light List—Atlantic Coast, United States" of the Lighthouse Service or Hydrographic Office Publication No. 205. Changes are announced in the Notices to Mariners.

These radiobeacons are intended for the use of vessels equipped with radio compasses and radio beacons are now recognized to be all-weather aids to navigation as well as fog signals. While the use of radiobeacons should not lead a mariner to neglect other precautions such as the use of the lead, etc., during thick weather, the bearings will greatly reduce the dangers incident to navigation in the fog.

The bearing of the radiobeacon may be determined with an accuracy of approximately 2° and at distances considerably in excess of the range of visibility of the most powerful coast lights. The apparatus is simple and may be operated by the navigator without the assistance of a radio operator or with the knowledge of the telegraph code. The radio direction finding apparatus consists of a radio receiving set, similar in operation to those used for radiotelegraph or radiotelephone reception, and a rotatable coil of wire in place of the usual antenna. By rotating the coil the intensity of the signal received from the transmitting station is made to vary, and by noting the position of the coil when the signal is heard at its minimum intensity, the bearing of the transmitting station is readily obtained.

It is important to note that the bearing of an incoming radio wave is subject to errors not unlike the deviation of the magnetic compass. Those using radio direction finding apparatus aboard ship are cautioned to bear these errors in mind and to keep the radio compass calibrated at all times. This may be done during clear weather by comparing the bearing obtained with the radio compass with the bearing as obtained by visual methods in general use. All radio bearings are subject to what is called "night effect", a variable error sometimes experienced near nightfall and sunrise. The uncertainty due to this cause may be lessened by taking repeated radio bearings.

The signals from the radiobeacons have definite characteristics for identifying the station, and bearings may be obtained with even greater facility than sight bearings on visible objects. At some of the stations radio and sound signals are synchronized for distance-finding purposes as explained under the following heading.

Distance finding.—Radiobeacon stations that are equipped for distance finding transmit a special radio signal and sound a corresponding air or submarine signal at the same period of time. Thus, whenever the sound signal of a radiobeacon distance finding station is operating, there is transmitted at the end of the radiobeacon minute of operation (1 minute out of every 3) a group of two radio dashes (a short dash and a long dash), 1 second and 5 seconds respectively; and a group of two sound signals of corresponding length is sounded at the same time. These signals are uniformly the same for all the distance-finding stations, except that the long fog-signal blast and corresponding long radio dash may be made

as short as 3 seconds where desired. They are entirely distinctive and should not be confused with the characteristic signals which identify the stations.

The reception of the sound signal by a vessel will be delayed, depending upon the distance the sound has to travel, whereas the radio signal will be received practically instantaneously. This delay is measured by observing the time that elapses between hearing a part of the group of radio dashes and the corresponding part of the group of sound blasts, say the end of the long radio dash and the end of the long sound blast. This elapsed time in seconds (time interval of sound travel in air) divided by 5 (or more exactly by 5.5) gives the approximate distance in nautical miles the observer is off the radiobeacon. The error of such observations should not exceed 10 percent.

The 1-second dash preceding the long dash is a stand-by signal as is also the 1-second blast. The latter serves as an identification signal to assure the observer that he is taking time on the correct sound signal blast.

Where the submarine oscillator is synchronized with the radiobeacon, the method of distance finding is the same, excepting that the interval of time in seconds (sound travel in water) is divided by 1.25 to obtain the distance in nautical miles.

For further details see Light Lists, published by the United States Lighthouse Service.

Radio bearings from other vessels.—Any vessel equipped with a radio-direction finder can give a bearing to a vessel equipped with a radio transmitter. Such service will generally be furnished when requested, particularly by Government vessels. These bearings, however, should be used only as a check, as comparatively large errors may be introduced by local conditions surrounding the radio-direction finder unless known and accounted for. Any radio station, the position of the transmitter of which is definitely known, may serve as a radiobeacon for vessels equipped with a radio-direction finder. However, mariners are cautioned that stations established especially for maritime service are more reliable and safer for use by the mariner, for numerous reasons.

Many navigators are using the ship's radio-direction finder as a help in avoiding collision in fog, detecting with it the presence and observing the direction of approaching vessels.

Caution in approaching lightships.—The attention of mariners is directed to the serious dangers which may arise from the misuse of radio signals, and particularly to the danger of collision with lightships operating such signals. The mariner who in thick weather approaches a radiobeacon directly ahead on a radio bearing and relies on hearing the fog signal in sufficient time to alter course to avoid danger is taking an unjustifiable risk. The vagaries of sound fog signals are well known, and warnings regarding them are widely printed; such signals may not be heard with certainty in time to avoid collision. Safety demands that all precautions be taken in approaching lightships. The risk of collision can be avoided by getting the radiobeacon on the bow, taking successive bearings, and ensuring that the radio bearing does not remain constant; the angle

between the course and the radiobeacon should increase for a vessel passing clear.

Nearly half of the radiobeacons on the coasts of the United States are placed on lightships, and these radio signals provide valuable marks for approaching the coasts and ports. In using radio bearings for approach, it is important that the courses at all times be set to pass safely clear. Radiobeacons offer to navigators a convenient means of checking this by methods well known in ordinary navigation but sometimes overlooked in navigation by radio bearings. The navigator may check his position with respect to the lightship radiobeacon when steering to pass to one side, by taking successive radio bearings and using these with the intervening distances run, to ascertain the distances off from time to time. Radio cross bearings should also be taken and the effect of currents should not be overlooked. Where warning radiobeacons and direct distance finding facilities are provided, they should be utilized. Soundings should not be neglected, as a few soundings in connection with a radio bearing or a chain of soundings alone usually give an excellent position. See Soundings and Echo Soundings, page 307.

The Nantucket Lightship is equipped with a *warning* radiobeacon. (See Light List, Atlantic Coast.)

The caution as to passing lightships at a safe distance, and approaching them using all care, of course, applies to all lightships, whether or not they are provided with radiobeacons, and it applies also to radiobeacons at lighthouses which may be approached close-to.

RADIO DIRECTION-FINDER STATIONS

United States naval direction-finder stations will furnish radio bearings to mariners of all vessels equipped with radiotelegraphic transmitters. While the use of these bearings should not lead a mariner to neglect other precautions, such as use of the lead, etc., during thick weather, these bearings will greatly reduce the dangers incident to navigation in the fog.

Accuracy of bearings.—The accuracy with which bearings can be taken depends on various conditions, and while bearings taken by a station can generally be considered accurate to within 2°, the Government cannot accept any responsibility for the consequences of a bearing being inaccurate.

In the case of bearings which cut the coast line at an oblique angle, errors of from 4° to 5° have been reported. Bearings obtained between about one-half hour before sunset and one-half hour after sunrise are occasionally unreliable. It is probable that the accuracy of a bearing is also affected if the ship's transmitting instrument is not adjusted to the correct wave length. Bearings signaled as "approximate" or "second class" should be regarded with suspicion as being subject to considerable error. The maximum distance for which bearings from these stations are accurate is 150 miles.

Direction-finder stations used as radiobeacons.—A naval direction finder station, when used as a radiobeacon, transmits upon request its call sign for 45 seconds on 375 kilocycles (800 m).

The following list of naval radio direction-finder stations will be of use to vessels navigating the approximate limits of this volume.

Naval radio direction-finder stations

Station	Latitude north			Longitude west		
	°	′	″	°	′	″
Virginia Beach, Va	36	51	10	75	58	33
Poyner Hill, N. C	36	17	17	75	47	49
Cape Hatteras, N. C	35	15	59	75	31	18
Cape Lookout, N. C	34	36	11	76	32	18
Folly Island, S. C	32	41	07	79	53	19
Jupiter, Fla	26	56	54	80	05	02

The above stations are noted on the charts by the symbol "N. R. C."

For a complete description of naval direction-finder stations together with directions for their use, see Hydrographic Office Publication No. 205, Radio Aids to Navigation.

CONVERSION OF RADIO BEARINGS TO MERCATOR BEARINGS

The increasing use of radio directional bearings for locations of ships' positions at sea, especially during foggy weather, has made it particularly desirable to be able to apply these radio bearings taken on shipboard or sent out by the shore stations directly to the nautical chart. These radio bearings are the bearings of the great circles passing through the radio stations and the ship, and unless in the plane of the Equator or of a meridian, would be represented on a Mercator chart as curved lines. Obviously, it is impracticable for a navigator to plot such lines on his chart, so it is necessary to apply a correction to a radio bearing to convert it into a Mercator bearing, that is, the bearing of a straight line on a Mercator chart laid off from the sending station and passing through the receiving station.

On page 23 is given a table of corrections for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radiobeacons or direction-finder stations and of the ship by dead reckoning. The latter is scaled from the chart, and the former either scaled from the chart or taken from the list of radiobeacon and radio direction-finder stations found in the Light List published by the United States Lighthouse Service or Hydrographic Office Publication No. 205.

The table is entered with the difference of longitude in degrees between the ship and station (the nearest tabulated value being used), and opposite the middle latitude, between the ship and station, the correction to be applied is read.

When bearings are taken from the ship the sign of the correction (bearings read clockwise from the north) will be as follows: In *north latitude* the minus sign is used when the ship is *east* of the radiobeacon, and the plus sign is used when the ship is *west* of the radiobeacon. In *south latitude* the plus sign is used when the ship is *east* of the radiobeacon, and the minus sign is used when the ship is *west* of the radiobeacon.

To facilitate plotting, 180° should be added to the corrected bearing, and the result plotted from the radiobeacon.

Should the position by dead reckoning differ greatly from the true position of ship as determined by plotting the corrected radio bearings, a retrial should be made, using the new value as the position of the ship.

If the bearing is from a radio direction finder station ashore, the sign of the correction will be reversed to that given when the bearing is taken from the ship.

Example.—A ship in latitude 37°20′ N., longitude 69°20′ W., by dead reckoning *receives* a radio bearing of 64° from a radio direction-finder station located in latitude 35°14′ N., longitude 75°32′ W. Find the Mercator bearing of the ship from the station—

Radio direction-finder station latitude	35°	14′	N., long.	75°	32′	W.
Dead reckoning position of ship	37	20		69	20	
Middle latitude	36	17	Diff.	6°	12′	

Entering table with difference of longitude=6°, which is the nearest tabulated value to 6°12′, and opposite 36° middle latitude (the nearest tabulated value to 36°17′) the correction 106′ is read. The ship being east of the station, the correction is plus. The Mercator bearing will then be the radio bearing received plus the correction from the table, 64°00′+106′=64°+1°46′=65°46′.

Table of corrections, in minutes

[Difference of longitude in degrees]

Mid. L.	½°	1°	1½°	2°	2½°	3°	3½°	4°	4½°	5°	5½°	6°	6½°	7°	7½°	8°	8½°	9°	9½°	10°
20°	5	10	15	21	26	31	36	41	46	51	56	62	67	72	77	82	87	92	98	103
21°	5	11	16	21	27	32	38	43	48	54	59	64	70	75	81	86	91	97	102	108
22°	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	96	101	107	112
23°	6	12	18	23	29	35	41	47	53	59	64	70	76	82	88	94	100	105	111	117
24°	6	12	18	24	31	37	43	49	55	61	67	73	79	85	92	98	104	110	116	122
25°	6	13	19	25	32	38	44	51	57	63	70	76	82	89	95	101	108	114	120	127
26°	7	13	20	26	33	39	46	53	59	66	72	79	85	92	99	105	112	118	125	131
27°	7	14	20	27	34	41	48	54	61	68	75	82	89	95	102	109	116	123	129	136
28°	7	14	21	28	35	42	49	56	63	70	77	84	92	99	106	113	120	127	134	141
29°	7	15	21	29	36	44	51	58	65	73	80	87	95	102	109	116	124	131	138	145
30°	7	15	22	30	38	45	53	60	68	75	83	90	98	105	113	120	127	135	143	150
31°	8	15	23	31	39	46	54	62	70	77	85	93	100	108	116	124	131	139	147	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	75	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

RADIO NAVIGATIONAL WARNINGS

In general, radio broadcasts of navigational warnings contain information of importance to the safety of navigation, such as the position of ice and derelicts, defects and changes to aids to navigation, advice about mine fields, etc.

In the United States, radio navigational warnings are compiled by the Hydrographic Office, Navy Department, and by the Bureau of Lighthouses, Department of Commerce. Those issued by the Hydrographic Office commence "Govt. Hydro." and end "Hydro"; those issued by the Bureau of Lighthouses commence "Govt. USLHS" and end "United States Lighthouse Service." Broadcasts frequently include warnings issued by both offices.

Scheduled broadcasts of navigational warnings are given in the Hydrographic Office Publication No. 205, Radio Aids to Navigation; a summary of such schedules is included in a sheet issued from time to time by the Hydrographic Office, listing broadcasts of United States Radio Stations.

Major hydrographic broadcasts, generally covering the Atlantic and Gulf coasts of the United States, are sent out daily by Washington through Arlington (NAA) and Annapolis (NSS). Local broadcasts, for particular areas, are made from stations listed below. Emergency broadcasts are made immediately upon receipt of information regarding imminent dangers.

The masters of every ship, which meets with dangerous ice, a dangerous derelict, a dangerous tropical storm, or any other direct dangers to navigation, should communicate the information, by all the means of communication at their disposal, to ships in the vicinity and also to the competent authorities at the first point of the coast with which they can communicate.

Local hydrographic broadcasts

Station	Area covered
Boston, Mass. (NAD)_____	South of lat. 45°00′ N. and north of Point Judith and Nantucket Shoal Lightship.
New York, N. Y. (NAH)_____	Lat. 42°00′ N. to lat. 38°30′ N.
Norfolk, Va. (NAM)_____	Lat. 39°00′ N. to lat. 33°00′ N.
Charleston, S. C. (NAO)_____	Lat 35°00′ N. to lat. 27°00′ N.
Key West, Fla. (NAR)_____	Coast of Florida east of long. 85°00′ E. (except east coast north of lat. 29°00′ N.) and important notices for Gulf of Mexico.
San Juan, P. R. (NAU)_____	Caribbean Sea north of lat. 15°00′ N. and West Indian waters generally.
Pensacola, Fla. (NAS)_____	Gulf of Mexico.
Galveston, Tex. (NKB)_____	Do.

FREE MEDICAL ADVICE TO SEAMEN BY RADIO

Arrangements are made in various countries whereby mariners of all nationalities may obtain medical advice by radio. Requests for medical advice of an urgent nature should be preceded by the urgent signal in order to give them priority over all other radio traffic except distress communications. The International Code of Signals, 1931, contains a medical section. By use of this code in communicating with foreign stations, difficulties of language may be avoided. The case-stating system in this medical section gives the nature of the information which should be included in the request

for medical advice. Whether the message is to be sent in code or plain language, it is recommended that the mariner read this section before preparing his message.

The United States Bureau of Public Health maintains the following stations at which free medical advice by radio may be obtained direct:

New York, N. Y., United States Marine Hospital No. 70. Alternate, United States Marine Hospital No. 21, Stapleton, N. Y.
Key West, Fla., United States Marine Hospital No. 10.

Governmental and commercial radio stations will transmit free messages addressed to any of the above stations. In order to avoid confusion and to make the practice uniform, all messages for transmission will be signed "Marine Hospital No. —", or "Public Health Service Relief Station No. —", as the case may be.

All coastal stations operated by the Radiomarine Corporation of America and the Tropical Radio Telegraph Co. offer free medical message service to ships of all countries.

Messages received from masters of vessels reporting symptoms observed in a sick member of the crew are promptly forwarded to the nearest marine hospital, where the case is diagnosed by the medical staff from the information given in the master's message. A course of treatment is then decided upon and suitable instructions are transmitted to the vessel. No charge is made for radiotelegraphic service of such messages when they are prefixed by "DH MEDICO."

The following is a list of Radiomarine Corporation and Tropical Radio Telegraph Co. stations on the Atlantic coast.

	Call letters		Call letters
Chatham, Mass.	WCC	Tuckerton, N. J.	WSC
Chatham, Mass.	WCM	Baltimore, Md.	WMH
Chatham, Mass.	WIM	Savannah, Ga.	WSV
Hingham, Mass.[1]	WBF	Palm Beach, Fla.	WOE
New London, Conn.	WSA	Hialeah, Fla.[1]	WAX
Brooklyn, N. Y.	WNY		

[1] Tropical Radio Telegraph Co.

The United Fruit Co. has established a gratuitous medical service, which is rendered from its hospitals in various countries of Central America and from the passenger ships in its service, and is available to the ships of all nationalities.

In cases of emergency, free medical advice may be obtained by ships at sea by radio from the Panama Canal, through the radio stations at Colon, Balboa, or Cape Mala. Such messages should be addressed, "Govt. C. B., Medico Pancanal", stating briefly and clearly the symptoms to be treated; and should be signed by the master.

Medical advice radiograms must be checked and sent "DH MEDICO." Such radiograms will be given preference over all other messages except SOS calls.

Radiograms must be signed by the master and state briefly but clearly the symptoms of the patient.

Medical advice will be phrased in language intelligible to the layman. Complete details relative to the service furnished by all companies is published in the manual, Ship Sanitation and First

Aid, issued by the Seaman's Church Institute of New York. This information contains diagrams and a list of symptoms to be considered in preparing messages.

In addition to the above, current information on this subject can be secured by referring to H. O. Pubi. No. 205, Radio Aids to Navigation.

WEATHER

Prevailing winds.—The winds are westerly north of the thirty-fifth parallel, except in September and October, when they are northeasterly along the entire coast. The westerly winds extend to the thirtieth parallel from December to April, inclusive. Easterly winds prevail along the Florida coast. At Key West they are northeasterly, except during the summer months, when they are southeasterly.

Northers.—In the winter months heavy northers occur in the vicinity of the Straits of Florida. They blow generally from northwest to north, hauling, as a rule, northward and eastward, and rarely backing. Their approach is nearly always heralded by a heavy bank of clouds in the northwest, preceded by light airs from the contrary direction, and accompanied by a falling barometer; they commence with a violent squall, gradually settling to a fresh gale. Vessels caught in the narrower parts of the straits in these gales are subject to a most trying sea.

Southeast gales also occur at intervals during the winter months in the vicinity of the Straits of Florida. They usually commence to blow at about east-northeast, freshening rapidly with a falling barometer and rising thermometer and, hauling southward and eastward, obtain their greatest force at about southeast.

Fog.—The percentage of fog is highest from March to June, reaching a maximum of 30 percent of days with fog near the mouth of Chesapeake Bay in June. This percentage decreases to 10 at Hatteras, but fog can be expected as far south as Florida.

STORM WARNINGS

Storm warnings are displayed by the United States Weather Bureau on the coasts of the United States and the Great Lakes.

The small craft warning.—A red pennant indicates that moderately strong winds that will interfere with the safe operation of small craft are expected. No night display of small craft warnings is made.

The northeast storm warning.—A red pennant *above* a square red flag with black center displayed by day, or two red lanterns, one above the other, displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northeast.*

The southeast storm warning.—A red pennant *below* a square red flag with black center displayed by day, or one red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southeast.*

The southwest storm warning.—A white pennant *below* a square red flag with black center displayed by day, or a white lantern *below* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *southwest.*

The northwest storm warning.—A white pennant above a square red flag with black center displayed by day, or a white lantern *above* a red lantern displayed by night, indicates the approach of a storm of marked violence with winds beginning from the *northwest.*

Hurricane, or whole gale warning.—Two square flags, red with black centers, one above the other, displayed by day, or two red lanterns, with a white lantern between, displayed by night, indicate the approach of a tropical hurricane, or one of the extremely severe and dangerous storms which occasionally move across the Great Lakes and Atlantic coast.

These warnings are displayed at all stations on the Atlantic and Gulf coasts of the United States and on the following islands in the Atlantic: Jamaica, Turks Island, Bermuda, Haiti, Curacao, Puerto Rico, Virgin Islands of the United States, St. Kitts, Dominica, Barbados, Trinidad, St. Lucia, St. Vincent, Grenada, and Cuba.

The following are the storm-warning display stations within the limits covered by this volume:

VIRGINIA:
- Cape Henry [2]
- Fort Monroe (Old Point Comfort)
- Newport News

NORTH CAROLINA:
- Beaufort
- Coinjock
- Columbia
- Edenton
- Elizabeth City
- Hatteras [2]
- Manteo [2 3]
- Morehead City
- New Berne [3]
- Southport
- Washington
- Wilmington [2]

SOUTH CAROLINA:
- Charleston [2] (Customhouse)
- Charleston (Lighthouse Depot)
- Georgetown.
- Moultrieville.
- North Island.
- Port Royal.

GEORGIA:
- Brunswick.
- Savannah.[2]
- Fort Screven (Tybee).

FLORIDA:
- Alligator Reef Lighthouse [3]
- American Shoal Lighthouse.[3]
- Carysfort Shoal Lighthouse.[3]
- Cocoa.[3]
- Daytonna Beach.[3]
- Eau Gallie.[3]
- Fernandina.
- Fort Pierce.[3]
- Fowey Rocks Lighthouse.[3]
- Jacksonville.[2]
- Key West.[2]
- Key West, corner Caroline and Elizabeth Streets.[3]
- Key West, No. 611 Front Street.[3]
- Melbourne.[3]
- Miami Weather Bureau.
- Miami Yacht Club.
- New Smyrna.[3]
- St. Augustine.
- Sombrero Key Lighthouse [3]
- Stuart.[3]
- Titusville.[3]
- West Palm Beach.[3]

NOTE.—The Weather Bureau station at Cape Henry, Va., is equipped for day and night communication with passing vessels. The International Code is used by day and the Morse Code, flash-light, by night. Messages to or from vessels will be forwarded to destination. At lighthouses and lightships warnings are not displayed at night.

Information relative to radiotelegraphic weather broadcasts will be found on page 18.

WEST INDIA HURRICANES

Tropical cyclones of the North Atlantic Ocean are usually designated as West India hurricanes, but actually many of these storms

[2] At these stations barometers will be compared with standards.
[3] Daytime display only.

originate and die out far from the mainland and hundreds of miles from the West Indies. The storm area varies from about 100 miles to 500 or more miles in width, with a comparatively calm center some 10 or 20 miles in diameter. This center is an area of lowest atmospheric pressure around which the wind blows in a more or less circular course (spirally) in a direction contrary to the hands of a watch. In some respects the center, or "eye" is the most dangerous part of the hurricane and is therefore a region especially to be avoided; for, although the air movement within it, if any, is usually light and fitful, the seas in this area in most cases are very heavy and confused, rendered so by the shifting violent winds surrounding it. The storm-field advances in a straight or curved track, sometimes with considerable speed, at other times at a very slow rate. The highest rates of progression usually occur when the storm moves northward or northeastward over the United States, or in middle or higher latitudes over the ocean. The average speed is about 12 or 15 miles an hour.

Hurricanes form over a wide range of the ocean between the Cape Verde and the Windward Islands, over the western part of the Caribbean Sea, and in the Gulf of Mexico. While some move northward in the beginning, especially those that originate southeast of Bermuda, the majority take a westerly to northwesterly course. Of these some curve gradually northward, either to the eastward of or above the larger islands of the West Indies, then turn northeasterly or easterly near to or at a considerable distance from the Atlantic coast of the United States. Others pass over or south of the greater islands and enter the Gulf of Mexico, thence curve northward or northeastward and strike some part of the east Gulf coast or continue to the westward and strike the west Gulf coast. Tracks of hurricanes are shown on the pilot charts of the North Atlantic Ocean and Central American waters, published monthly by the United States Hydrographic Office.

The hurricane season is likely to begin in June and close with November. The months of greatest frequency are August, September, and October. Hurricanes are most likely to be severe during August and the early half of September. During all the months of the season, however, the possibilities of encountering an intense storm are sufficiently great to warrant the mariner in keeping careful watch of the weather elements while in these waters. Information concerning Hurricane Warnings issued by the United States Weather Bureau is contained in this volume under Radiotelegraphic Weather Broadcasts (p. 18).

Signs of approach.—One of the earliest signs of a hurricane is the appearance of high cirrus clouds which converge toward a point on the horizon that indicates the direction of the center of the storm. The snow-white fibrous mares' tails appear when the center is about 300 or 400 miles distant. Another usual early indication is a long, heavy swell propagated to a considerable distance, sometimes two or three days in advance, when there is no intervening land to interrupt it. This swell comes from the general direction in which the storm is approaching. There is usually a slight rise of the barometer at the outset, followed by a continuous fall. In front of the storm, if it is advancing in some westerly direction toward the observer, the winds blow from a northerly point (northeast, north, or northwest);

if in some northerly direction toward the observer, they will blow from an easterly point (southeast, east, or northeast). A further indication is a rough, increasing sea. If one or more of these signs be wanting, there is little cause for anticipating a hurricane.

As the storm center approaches the barometer continues to fall; the velocity of the wind increases and blows in heavy squalls, and the changes in its direction becomes more rapid. Rain in showers accompanies the squalls, and when closer to the center the rain is continuous and attended by furious gusts of wind; the air is frequently thick with rain and spume drift, making objects invisible at a short distance. A vessel on a line of the hurricane's advance will experience the above disturbances, except that as the center approaches the wind will remain from the same direction, or nearly so, until the vessel is close to or in the center.

Distance from center.—The distance from the center of a hurricane can only be estimated from a consideration of the height of the barometer and the rapidity of its fall, and the velocity of the wind and rapidity of its change in direction. If the barometer falls slowly and the wind increases gradually it may be reasonably supposed that the center is distant; with a rapidly falling barometer and increasing winds the center may be supposed to be approaching dangerously near.

Practical rules.—When there are indications of a hurricane, vessels should remain in port or seek one if possible, carefully observing and recording the changes in barometer and wind and taking every precaution to avert damage by striking light spars, strengthening moorings, and if a steamer, preparing steam to assist the moorings. In the ports of the Southern States hurricanes are generally accompanied by very high tides, and vessels may be endangered by overriding the wharf where moored if the position is at all exposed.

Vessels in the straits of Florida may not have the sea room to maneuver so as to avoid the storm track and should use every endeavor to make a harbor or stand out of the straits to obtain sea room. Vessels unable to reach port and having sea room to maneuver should observe the following rules:

When there are indications of the near approach of a hurricane, sailing vessels should heave to on the starboard tack and steamers remain stationary and carefully observe and record the changes in wind and barometer so as to find the bearing of the center and ascertain by the shift of wind in which semicircle the vessel is situated. The safety of the vessel often depends on heaving to in time.

Bearings of center.—Facing the wind, the storm center will be 8 to 12 points to the right; when the storm is distant it will be from 10 to 12 points, and when the barometer has fallen five- or six-tenths it will be about 8 points.

A line drawn through the center of a hurricane in the direction in which it is moving is called the axis or line of progression, and facing in the direction of its path the semicircle on either side of the axis is called, respectively, the right hand or dangerous semicircle and the left hand or navigable semicircle.

To find in which semicircle the vessel is situated:

If the wind shifts to the right, the vessel will be in the right hand or dangerous semicircle with regard to the direction in which the

storm is traveling, in which case the vessel should be kept on the starboard tack and increase her distance from the center.

If the wind shifts to the left, the vessel will be in the left or navigable semicircle. The helm should be put up and the vessel run with the wind on the starboard quarter, preserving the compass course, if possible, until the barometer rises, when the vessel may be hove to on the port tack, or if there is not sea room to run the vessel can be put on the port tack at once.

Should the wind remain steady and the barometer continue to fall, the vessel is in the path of the storm and should run with the wind on the starboard quarter into the navigable semicircle.

In all cases act so as to increase as soon as possible the distance from the center, bearing in mind that the whole storm field is advancing.

In receding from the center of a hurricane the barometer will rise and the wind and sea subside.

TIDES AND CURRENTS

Tide tables for the Atlantic Ocean are published in advance annually by the Coast and Geodetic Survey, price 25 cents. This volume supplies full tidal data for the east coast of North and South America, the west and north coasts of Africa, and all of Europe.

It contains a table of full daily predictions of the times and heights of high and low waters for certain reference stations along the coast, with full explanations for the use of this table. The use of table 2 of the Tide Tables should be known to every navigator. By means of this table the predictions given for the reference ports are extended so as to enable one to obtain the predictions for each day for a large number of other stations.

The effect of strong winds, in combination with the regular tidal action, may at times cause the water to fall below the plane of reference of the chart, mean low water. The water may also rise about the same amount above mean high water, due to similar causes.

Caution.—In using the Tide Tables, slack water should not be confounded with high or low water. For ocean stations there is usually but little difference between the time of high or low water and the beginning of ebb or flood current; but for places in narrow channels, landlocked harbors, or on tidal rivers the time of slack current may differ by two or three hours from the time of high or low water stand, and local knowledge is required to enable one to make the proper allowances for this delay in the condition of tidal currents. To obtain the times of slack water, reference should be made either to figures given for various places in this volume of the Coast Pilot or to the Current Tables.

Current Tables for the Atlantic coast of the United States are published in advance annually by the United States Coast and Geodetic Survey. This volume, which sells for 10 cents per copy, includes the daily predicted times of slack water and the times and velocities of strength of flood and ebb for certain reference stations and a table of current differences and constants by means of which corresponding daily predictions may be readily obtained for numerous other places. These tables also include current diagrams for six bodies of water along the coast which show in a graphical

form the velocities of the flood and ebb currents and the times of slack and strength over a considerable stretch of the channel of these waterways.

CURRENTS, CAPE HENRY TO KEY WEST

From our present information the indications are that, except during northerly and northeasterly winds, a current of about 0.5 knot, setting northeastward with the trend of the coast, may be expected outside the 10-fathom (18.3 m) curve as far north as Cape Hatteras, and that it increases offshore toward the axis of the Gulf Stream.

Strong currents are produced by the wind along the coast in northeasterly and southerly gales, reversing or greatly accelerating the normal current. Their strength and set depend on the direction, strength, and duration of the gale. A table showing the direction and velocities of the currents that may be expected with winds of given strength is given on page 37.

The following is a more detailed statement of the currents along the coast:

Latitude 37°05′ N., longitude 75°41′ W. (off the entrance to Chesapeake Bay).—The tidal current here is only very slightly rotary and appears to turn counterclockwise. The strength of the flood current occurs about one hour after flood begins at Chesapeake Bay Entrance and sets 265° with a velocity of about 0.3 knot. The strength of the ebb current comes about one and one-half hours after ebb begins at Chesapeake Bay Entrance and sets 85° with a velocity of about 0.3 knot. Since the current is only slightly rotary, there is practically slack water at Cape Charles Lighted Buoy about two hours before ebb begins, and also about two hours before flood begins at Chesapeake Bay Entrance.

Diamond Shoal Lightship (off Cape Hatteras, N. C.).—The tidal current here is rotary, turning clockwise, but very weak, the velocity of the current at times of strength being less than a tenth of a knot. The currents encountered off Cape Hatteras are, therefore, nontidal and depend chiefly on the wind and on the Gulf Stream. Winds from the southwest, south, and southeast directions bring about the strongest currents, which set northeastward, a wind of 35 miles per hour bringing about a current of 1¼ knots. Winds from the northeast and northwest are only about 50 percent as effective in producing currents, a wind of 35 miles per hour from the northeast or northwest bringing about a southerly current of about ½ knot.

Cape Lookout Shoals Lighted Whistle Buoy (off Cape Lookout, N. C.).—The tidal current here is rotary, turning clockwise. The strength of the flood current occurs about one hour after flood begins at Charleston Harbor Entrance and sets 275° with a velocity of about 0.4 knot. The strength of the ebb current comes about one hour after ebb begins at Charleston Harbor Entrance and sets 95° with a velocity of about 0.4 knot. The minimum currents before flood and ebb are about 0.2 knot. Since the tidal current here is weak, the currents brought about by the winds completely mask the tidal currents. In general the current appears to set northeastward in the summer months and southward during the winter months, with an average velocity of about 0.3 knot.

Frying Pan Shoals Lighted Whistle Buoy 2 A. F. P. (off Cape Fear River, N. C.).—The tidal current here is rotary, turning clockwise.

The strength of the flood current occurs about one hour after flood begins at Charleston Harbor Entrance and sets 295°, with a velocity of about 0.3 knot. Strength of ebb comes about one hour after ebb begins at Charleston Harbor Entrance and sets 120°, with a velocity of about 0.4 knot. The minimum current before flood comes about two hours before flood begins at Charleston Harbor Entrance, setting southwestward with a velocity of about 0.2 knot. The minimum current before ebb comes about two hours before ebb begins at Charleston Harbor Entrance, setting northeastward with a velocity of about 0.2 knot.

Charleston Lighted Whistle Buoy C (off the entrance to Charleston Harbor, S. C.).—The current is rotary, turning clockwise. The strength of the flood current occurs about one hour after flood begins at Charleston Harbor Entrance and sets 265°, with a velocity of about 0.3 knot. The strength of the ebb current comes about one and three-fourths hours after ebb begins at Charleston Harbor Entrance and sets 95°, with a velocity of about 0.3 knot. The minimum currents before flood and ebb set southward and northward, respectively, with a velocity of about 0.2 knot.

Martins Industry (five miles east of the entrance to Port Royal Sound, S. C.).—The current here is rotary, turning clockwise. The strength of the flood current occurs about two and one-half hours after flood begins at Charleston Harbor Entrance and sets 285°, with a velocity of about 0.6 knot. The strength of the ebb current comes about one and one-fourth hours after ebb begins at Charleston Harbor Entrance and sets 105°, with a velocity of about 0.6 knot. The minimum currents before flood and ebb set southward and northward, respectively, with a velocity of about 0.2 knot.

Savannah Lightship (off the entrance to the Savannah River, Ga.).—The tidal current here is rotary, turning clockwise. The strength of the flood current occurs about one and one-half hours after flood begins at Savannah River Entrance and sets 295°, with a velocity of about 0.3 knot. The strength of ebb current occurs about two and three-fourths hours after ebb begins at Savannah River Entrance and sets 115°, with a velocity of about 0.5 knot. The minimum currents before flood and ebb are very small, setting southward and northward, respectively, with velocities of about 0.1 knot.

Brunswick Lighted Whistle Buoy 2 B (off the entrance to St. Simon Sound, Ga.).—The tidal current is rotary, turning clockwise. The strength of the flood current occurs about one and one-half hours after flood begins at Miami Harbor Entrance and sets 295°, with a velocity of about 0.5 knot. The strength of the ebb current comes about two hours after ebb begins at Miami Harbor Entrance and sets 115°, with a velocity of about 0.5 knot. The minimum currents before flood and ebb set southward and northward, respectively, with velocities of about 0.1 knot.

THE GULF STREAM

The Gulf Stream sets eastward and northward through the Straits of Florida, and after passing between Fowey Rocks and Little Bahama Bank it continues northward and then northeastward, following the general direction of the 100-fathom (183 m) curve as far as Cape Hatteras.

In general, the Gulf Stream as it issues into the sea through the Straits of Florida may be characterized as a swift current of highly saline blue water, whose upper stratum is composed of warm water. At its junction with ordinary sea water the edges may frequently be recognized in moderate weather by the ripples which occur as well as by the difference in color. Northward, in the cooler regions, the evaporation from its surface, when the temperature of the air is lower than that of the water, is apparent to the eye. In addition, in the lower latitudes, the stream carries with it a quantity of weed known as "gulf weed", which is familiar to all who have navigated its waters.

The axis of the Gulf Stream, or line of greatest velocity, lies from 10 to 20 miles eastward of the 100-fathom (183 m) curve.

Between Cuba and the Florida Reefs, off Habana, the axis of the stream is nearer the Cuban coast; but after making the bend between Salt Key Bank and Florida Reefs, the axis of the stream approaches the coast of Florida and lies from 4 to 11 miles outside the 100-fathom (183 m) curve.

The mean surface velocity of the Gulf Stream is 3.5 knots at a point 11½ miles east of Fowey Rocks and 2.2 knots at a point 60 miles south of Rebecca Shoal. These points are on the axis of the stream, or where the current is a maximum, the velocity of the stream decreasing gradually from these central points as the edges of the stream are approached. These velocities are affected considerably by prevailing winds.

The following tables give the mean surface velocity of the Gulf Stream in two cross sections in the Straits of Florida:

Mean surface velocity of Gulf Stream

Between Rebecca Shoal and Cuba

Distance south of Rebecca Shoal	Mean surface velocity observed
Nautical miles	*Knots*
20	0. 3
35	0. 7
50	2. 2
68	2. 2
86	0. 8

Between Fowey Rocks and Gun Key

Distance east of Fowey Rocks	Mean surface velocity observed
Nautical miles	*Knots*
8	2. 7
11½	3. 5
15	3. 2
22	2. 7
29	2. 1
36	1. 7

On issuing into the sea northward of Little Bahama Bank the Gulf Stream loses the relatively great velocity which characterized it within the straits. There is a gradual decrease to a velocity of about 2 knots off St. Augustine, Fla., in latitude 30° N. Here the Gulf Stream is joined by the Antilles Current, which flows northwesterly along the open ocean side of the West Indies before uniting with the Gulf Stream.

The Antilles Current, like the Gulf Stream, carries warm, highly saline water of clear indigo blue. The union of the two currents

gives rise to a broad current possessing about the same characteristics as the Gulf Stream within the Straits except that the velocity is much reduced. The combined current turns more and more easterly so that off the cost of Georgia the Gulf Stream bears northeast, maintaining this general direction past Cape Hatteras.

From within the straits the axis of the Gulf Stream runs approximately parallel with the 100-fathom (183 m) curve as far as Cape Hatteras, a distance of about 800 geographical miles, but at varying distances from the shore which sweeps northward in a sharper curve than does the 100-fathom (183 m) curve. Within the straits it is about 10 miles offshore; in the bight off the coast of Georgia the distance is about 100 miles; and at Cape Hatteras it is about 35 miles.

Earler systematic observations on the Gulf Stream dealt with the temperature of the water rather than its motion and the axis taken to be along the line of highest temperature obtained. Later the axis was taken to mark the line of greatest velocity. Ordinarily it is assumed that the two axes coincide but this is by no means certain. The thermometer, although it indicates the limits of the stream in a general way, is therefore only an approximate guide to the velocity of the current, nor is it to be assumed that the northerly set will be lost when the thermometer shows a region of cold sea water.

Within the straits the lateral boundaries of the Gulf Stream can be fixed with considerable precision. When the stream issues into the sea it is not difficult to define the western limits since the waters of the stream differ in color, temperature, salinity, and flow from the inshore coastal waters. On the east, due to the influx of the Antilles Current, the waters merge gradually with the waters of the Atlantic, and the limits of the stream cannot be fixed with precision. With regards to direction of flow, however, the limits may be fixed to include all waters flowing parallel to the axis but these limits vary with the seasons and with changing conditions of wind and weather.

Recent observations of the Coast and Geodetic Survey indicate that the inner limit of the Gulf Stream as far as Cape Hatteras may be approximately defined as the 50-fathom (91 m) curve.

Considering the outer edge as a line along which the current is still approximately parallel to the axis of the Gulf Stream, the width of stream northward of its outfall is as follows: Off Cape Canaveral about 70 miles; off the coast of Georgia after its union with the Antilles Current about 150 miles; off Cape Hatteras about 200 miles.

Off Cape Hatteras the wide-spreading current separates into numerous bands which is indicated by the juxtaposition of warm and cold bands of water of varying widths. This feature, though not so marked, is also noticed below Cape Hatteras.

It has been noted that the western or inner side of the Gulf Stream is separated from the coastal waters by a zone of rapidly falling temperature, to which the term "cold wall" has been applied. The abrupt change in the temperature of the waters separated by the cold wall is frequently very striking and is a definite indication of the edge of the stream. It is most clearly marked north of Cape Hatteras, but extends more or less well-defined, from the Straits to the Banks of Newfoundland. In the vicinity of the Banks of Newfoundland the cold wall represents the dividing line between

the warm current of the Gulf Stream and the cold waters of the Labrador Current which, according to observations, turns sharply, between parallels 42 and 43 and meridians 51 and 52, and flows easterly, parallel to the Gulf Stream.

Beyond the Banks of Newfoundland the identity of the Gulf Stream as such is lost but its general direction is preserved by reason of the prevalence of westerly winds, and its set toward Europe is continued until the continental shores are approached, when in the vicinity of the Azores, the current divides, one branch flowing to the northeastward and entering the Arctic regions and the other to the south and east in the direction of the African coast.

As previously mentioned daily and seasonal fluctuations as to location, velocity, and temperature have been demonstrated as occurring due to winds, and variations in barometric pressure and in temperature in the region through which it flows. A further cause of fluctuation is found in the variations of the currents which feed it or which, like the Labrador Current, come in conflict with it. Variations due to tidal currents are now considered as only minor in character.

A steamer bound from Cape Hatteras to Habana, or the Gulf ports, crosses the stream off Cape Hatteras. A fair allowance to make in crossing the stream is 1½ knots in a northeasterly direction for a distance of 40 miles from the 100-fathom (183 m) curve.

Crossing the Gulf Stream at Jupiter or Fowey Rocks, an average allowance of 2½ knots in a northerly direction should be made for the set of the current.

Crossing the stream from Habana, a fair allowance for the average current between 100-fathom (183 m) curves is 1.1 knots in an east-northeasterly direction.

The approximate mean positions of the inner edge and axis (point where greatest velocity may be found) are indicated in the following table:

Approximate mean position of the Gulf Stream

Locality	Inner edge	Axis
	Nautical miles	*Nautical miles*
North of Habana, Cuba		25
Southeast of Key West, Fla		45
East of Fowey Rocks, Fla		10
East of Miami Beach, Fla		15
East of Palm Beach, Fla		15
East of Jupiter Inlet, Fla		20
East of Cape Canaveral, Fla	10	45
East of Daytona Beach, Fla	25	75
East of Ormond Beach, Fla	25	75
East of St. Augustine, Fla. (coast line)	40	85
East of Jacksonville, Fla. (coast line)	55	90
Southeast of Savannah, Ga. (coast line)	65	95
Southeast of Charleston, S. C. (coast line)	55	90
Southeast of Myrtle Beach, S. C.	60	100
Southeast of Cape Fear, N. C. (light)	35	75
Southeast of Cape Lookout, N. C. (light)	20	50
Southeast of Cape Hatteras, N. C.	10	35
Southeast of Virginia Beach, Va.	85	115
Southeast of Atlantic City, N. J.	120	
Southeast of Sandy Hook, N. J.	150	

At the western end of the Straits of Florida the limits of the Gulf Stream have not yet been well defined, and for this reason the location of the inner edge has been omitted for Habana, Cuba, and Key West, Fla., in the above table. Between Fowey Rocks and Jupiter Inlet the inner edge is deflected westward and lies very close to the shore line.

Along the Florida Reefs between Alligator Reef and Dry Tortugas the distance of the northerly edge of the Gulf Stream from the edge of the reefs gradually increases toward the westward. Off Alligator Reef it is quite close inshore, while off Rebecca Shoal and Dry Tortugas it is possibly 15 to 20 miles south of the 100-fathom (183 m) curve. Between the reefs and the northern edge of the Gulf Stream the currents are ordinarily tidal and are subject at all times to considerable modification by local winds and barometric conditions. This neutral zone varies in both length and breadth; it may extend along the reefs a greater or less distance than stated, and its width varies as the northern edge of the Gulf Stream approaches or recedes from the reefs.

The approximate position of the axis of the Gulf Stream for various regions is shown on the following Coast and Geodetic Survey charts: No. 1002, Straits of Florida; No. 1007, South Carolina to Cuba; No. 1112, Cape Canaveral to Key West; No. 1113, Alligator Reef to Habana. Chart No. 1001 shows also the position of the inner edge of the Gulf Stream from Chesapeake Bay to Straits of Florida.

WIND CURRENTS

There are given below the results of recent investigations on the currents caused by local winds. These investigations are based on observations made on a number of the lightships along the Atlantic coast from Nantucket Shoals Lightship to Brunswick Lightship. The results, therefore, apply more directly along the route between lightships but are applicable also to the coastal sailing routes farther offshore.

Direction of current due to wind.—It is evident that a wind continuing for some time will give rise to a current, the velocity of which increases with an increase in the velocity of the wind; and the mariner has taken it for granted that this current brought about by the wind sets in the same direction as the wind. But the results of careful observations show that this is not the case. Instead of setting with the wind, the current on the Atlantic coast of North America produced by local winds sets, on the average, about 20° to the right of the wind.

For example, a wind blowing from north will, on the North Atlantic coast, bring about a current that sets not south, but about 20° to the right of south, or 200°. Similarly a wind from south will produce a current setting 20° to the right of north, or 20°. It is to be noted that while the current due to the wind will, on the North Atlantic coast, set 20° to the right of the wind direction, the current which a vessel experiences at any time is the resultant of the combined actions of the tidal current, the wind current, and any other currents, such as the Gulf Stream or currents due to river discharge.

Velocity of current due to wind.—The velocity of the current brought about by winds of different velocities is given in the table below. It will be seen that on the Atlantic coast of the United States the velocity of the wind current is about 1½ percent of the velocity of the wind.

Table of current velocity due to wind—North Atlantic coast

Wind velocity—miles per hour	10	20	30	40	50	60
Current velocity—knots	0. 2	0. 3	0. 4	0. 6	0. 8	1. 0

An easily remembered working rule to get the velocity of the current due to wind along the Atlantic coast is to multiply the velocity of the wind (in miles per hour) by 1½ and point off two places. This will give the velocity of the current in knots. For example, to determine the current due to a 40-mile wind we have $40 \times 1\frac{1}{2} = 60$, and pointing off two decimal places gives 0.60, or six-tenths of a knot.

VARIATION OF THE COMPASS

The magnetic variation for 1936 and the annual increase or decrease at points mentioned are as follows:

Magnetic variation

Locality	Variation	Annual increase or decrease
Off Cape Henry (10 miles)	6¾° W.	Increase, 3′.
Off Cape Hatteras (12 miles)	6¼° W.	Do.
Off Cape Lookout (15 miles)	4½° W.	Increase, 2′.
Off Cape Fear (15 miles)	3° W.	Do.
Off Charleston entrance	1° W.	Increase, 1′.
Off Savannah (on bar)	0°	Increase, 1′ (W.).
On Doboy Sound bar	½° E.	Decrease, 1′.
St. Johns River (outside jetties)	1° E.	Do.
Off Cape Canaveral (12 miles)	¾° E.	Do.
At Fowey Rocks Light	1½° E.	Increase, 1′.
At Alligator Reef Light	2° E.	Do.
At Sombrero Key Light	2¼° E.	Do.
At Sand Key Light	2¾° E.	Do.
At Rebecca Shoal Light	3° E.	Do.
Hole in the Wall (Bahamas)	¼° W.	Increase, 1′.
At Great Isaac Light (Bahamas)	1° E.	Do.
On Salt Key Bank (north of Cuba)	2° E.	Increase, 1′.
Middle of Albemarle Sound (off Bull Bay)	5¾° W.	Increase, 3′.
Middle of Croatan Sound	6¼° W.	Do.
Middle of Pamlico Sound (north of Ocracoke)	5½° W.	Do.

INLAND WATERWAYS

The following data concerning the Intracoastal Waterway, from Boston, Massachusetts, to the Rio Grande, the route across Florida, the New York canal system, the Lakes-to-Gulf waterway, and the other river channels tributary to the Mississippi are included for ready reference.

THE INTRACOASTAL WATERWAY

The Intracoastal Waterway affords a protected route, with the exception of various short sections, for vessels between Boston, Massachusetts, and the Rio Grande, a distance of approximately 3,100 miles. No toll is charged for passage as the waterway is under Federal jurisdiction. Navigation is restricted, however, by the limiting depths, and horizontal and vertical clearances in the various sections of the waterway. The controlling horizontal clearance for the entire route is 39½ feet (12.0 m) at the Palm Valley bridge in Florida. The locks in the alternate route through the Dismal Swamp Canal have a controlling horizontal clearance of 36 feet (11.0 m). The height of the masts of vessels is restricted by the vertical lift bridge at Boynton, Florida, to 42.6 feet (13.0 m).

Aids to navigation.—The United States Lighthouse Service has recently adopted a uniform method of marking for the Intracoastal Waterway to be generally applied south of Norfolk, both on the Atlantic and Gulf coasts. The present aids will be changed as rapidly as practicable and all aids subsequently established will conform with the system.

In proceeding in a southerly direction along the Atlantic coast and thence generally westerly along the Gulf coast the port hand is considered as on the left, starboard on the right, and aids colored and numbered accordingly. The use of the triangle or square and the color yellow, as indicated below, will be characteristic of the aids marking any part of the Intracoastal Waterway.

Red lights, starboard side, surmounting red superstructures with red triangular daymarks, with yellow borders, even numbers in white at the center of the daymark.

White or green lights, port side, surmounting black superstructures with black square daymarks, with yellow borders, odd numbers in white at the center of the daymark.

Daymarks or unlighted beacons, starboard side, red triangles with yellow borders, even numbers in white at the center of the daymark.

Daymarks or unlighted beacons, port side, black squares with yellow borders, odd numbers in white at the center of the daymark.

Single pile structures on which the triangular or square daymarks are not used will be fitted with a pointer board directed toward the channel. The top half of the starboard piles, including the pointer board, will be red with even white numbers; the top half of the port piles, including the pointer board, will be black with odd numbers in white.

Where the Intracoastal Waterway traverses channels in rivers and inlets already marked as entered from seaward the numbering, coloring, etc., of aids in the latter will remain unchanged. In such cases a yellow triangle or square is added to daymarks or to buoys to indicate the relation of the aid to the Intracoastal Waterway.

Boston to New York Harbor.—Between Boston and Long Island Sound it is necessary to pass through comparatively exposed waters and no inland route exists except for the passage through the Cape Cod Canal and its approaches.

The Cape Cod Canal extends from Cape Cod Bay to Buzzards Bay and with its approach channels affords a sea-level waterway 12.6 miles in length. The controlling depth in January 1936, was 23 feet

(7.0 m) at mean low water in the canal. Widening and deepening of the canal and the work of constructing two new high-level highway bridges and a vertical lift railroad bridge to replace the existing drawbridges is now nearly completed. The controlling vertical clearance through the canal is 135 feet (41 m) at high water.

From the canal the route generally followed extends from Buzzards Bay to the Atlantic Ocean, thence through Block Island and Long Island Sounds, and the East River to upper New York Bay, thence through the more open waters to lower New York Bay. There are numerous harbors on both sides of Long Island Sound.

An inland waterway extends along a portion of the south side of Long Island and affords a protected route from Gardners Bay to East Rockaway Inlet with a controlling depth of 4 feet (1.2 m).

New York Harbor to Delaware Bay.—An outside run between New York Bay and Delaware Bay is now necessary except for vessels whose draft permits use of the New Jersey Inland Waterway. This waterway is entered at its northern end through Manasquan Inlet, 23 miles, south of Sandy Hook, and extends for 109 nautical miles to Cape May Inlet at Cape May. The waterway is maintained by the State of New Jersey as a 6-foot (1.8 m) project but the controlling depth in October 1935 was reported to be 4 feet (1.2 m). Vessels are obliged to run outside from Sandy Hook to Manasquan Inlet, and to round Cape May and cross the lower reaches of Delaware Bay to the Chesapeake and Delaware Canal.

The Intracoastal Waterway formerly extended from New York Bay through the Raritan River, the Delaware and Raritan Canal, and the Delaware River to Delaware Bay. The Delaware and Raritan Canal, now under the jurisdiction of the State of New Jersey, has not been open to navigation since 1933.

Investigations for the most desirable route for the New York-Delaware Bay section of the Intracoastal Waterway have been completet and the route, extending between Sayreville, N. J., on the Raritan River and Bordentown, N. J., on the Delaware River, with a minimum depth of 25 feet (7.6 m) and a minimum width of 250 feet, was recommended to Congress under date of January 10, 1934.

Delaware Bay to Norfolk.—The Chesapeake and Delaware Canal is a sea-level route which extends, for a distance of 19 miles, from Reedy Point on the Delaware River 40 miles below Philadelphia, Pa., to the junction of Back Creek and Elk River, about 4 miles west of Chesapeake City, Md. In June 1935 the controlling depth was 9.7 feet (3.0 m) although the conditions are such that a draft of 12 feet (3.6 m) can usually be carried through by taking advantage of the tide.

From the junction of the canal into Chesapeake Bay to Norfolk, a distance of 210 miles through Chesapeake Bay, depths in excess of 12 feet (3.6 m) obtain.

Norfolk to Beaufort entrance.—A sea-level waterway, paralleling the Atlantic coast, with a tidal lock at Great Bridge, Va., is afforded by the route through the Albemarle and Chesapeake Canal, the Alligator River-Pungo River Canal, and the sounds of North Carolina. The project for this waterway provides a depth of 12 feet (3.6 m) at mean low water but the controlling depth was 11 feet (3.4 m) in the early part of 1935.

The alternate route to Albemarle Sound by way of the **Dismal Swamp Canal**, a lock canal, has a controlling depth of 9 feet (2.7 m).

The section of the Intracoastal Waterway between Norfolk, Va., and Beaufort, N. C., with the alternate route through the Dismal Swamp Canal is more fully discussed in the section under "Waterways from Norfolk to Albermale Sound" on page —.

Navigation is practicable throughout the year on both of the above-named routes.

Beaufort entrance to Winyah Bay.—In June 1934 there was a controlling depth of 11 feet (3.4 m) from Beaufort Harbor to Wrightsville, thence 12 feet (3.7 m) to the Cape Fear River.

The new cut from Cape Fear River to Winyah Bay has not yet been completed and vessels whose draft will not permit crossing the bar at Little River Inlet, S. C., are required to go outside from Cape Fear River to Winyah Bay, a distance of about 73 miles.

A depth of 8 feet (2.4 m) is available in the waterway to Little River Inlet from Cape Fear River, a distance of about 28 miles. In August 1935 the low water depth in Little River Inlet was about 4½ feet (1.4 m). The channel across the bar, although subject to change, is well buoyed. Navigation, however, should not be attempted except on a rising tide and only after securing local information. The distance from Little River Inlet Lighted Bell Buoy to Winyah Bay Entrance Bell Buoy is 47 nautical miles.

Winyah Bay to Charleston.—Dredging of this section of the waterway to a project depth of 10 feet (3.0 m) is now in progress (April 1935). In September 1935 it was reported that navigation was restricted to a draft of 3½ feet (1.1 m) at mean low water at one point and 5½ feet (1.7 m) at mean low water through several reaches between Minim Creek and Charleston.

Charleston to the St. Johns River, through the rivers and sounds of South Carolina and Georgia.—The project depth through the main waterway is 7 feet (2.1 m). The controlling depth for this section is in Brickyard Creek, north of Beaufort, S. C., where there is a depth of 5 feet (1.5 m) at mean low water.

St. Johns River to Miami.—This section of the waterway extends from the St. Johns River by way of the old Florida East Coast Canal through natural and connecting waterways to Miami on Biscayne Bay. A project depth of 8 feet (2.4 m) at mean low water is being maintained although the controlling depth may be temporarily reduced by shoaling.

Miami to Key West.—The route north of the Florida Keys has a controlling depth of 4 feet (1.2 m) which occurs in the northern channel through Shell Key Bank.

The route through Hawk Channel has a controlling depth of 10 feet (3.0 m).

Anchorages, sheltered from all ordinary weather, may be found anywhere along these passages, in the lee of reefs and keys.

Key West to Apalachicola.—There is outside passage only from Key West to San Carlos Bay (at the mouth of the Caloosahatchie River). Shelter from weather is afforded, however, by sheltered anchorages in Shark River, among the Ten Thousand Islands, and in the passes at Cape Romano.

From San Carlos Bay there is an inland channel with a controlling depth of 6 feet (1.8 m) through Pine Island Sound to Charlotte Harbor.

Outside passage is necessary from Charlotte Harbor to Venice Inlet.

An inland channel through shoal areas is available from Venice Inlet by way of Tampa Bay to Clearwater Harbor with controlling depths of 3 feet (0.9 m) from Venice to Sarasota, 7 feet (2.1 m) from Sarasota to Tampa, and 3 feet (0.9 m) from Tampa Bay to Clearwater Harbor.

Outside passage is necessary from Clearwater Harbor to Apalachicola Bay.

Apalachicola to Pensacola.—The channel from Apalachicola River to St. Andrews Bay provides a protected route with a controlling depth of 5 feet (1.5 m).

Outside passage is necessary between St. Andrews Bay and Choctawhatchee Bay.

An inland waterway by way of the Narrows and Santa Rosa Sound affords a passage with a controlling depth of 9 feet (2.7 m) between Choctawhatchee Bay and Pensacola Bay.

Pensacola Bay to New Orleans.—The controlling depth in the waterway between Pensacola Bay and Mobile Bay is 9 feet (2.7 m).

The major portion of the waterway between Mobile and New Orleans is subject to rough weather as it follows the open waters of Mississippi Sound and Lake Pontchartrain. The controlling depth is 9 feet (2.7 m).

New Orleans to Galveston.—The controlling depth in this section is 9 feet (2.7 m).

Galveston to Corpus Christi.—The controlling depths are as follows: Galveston to Brazos River, 3 feet (0.9 m); Brazos River to Matagorda Bay, 2 feet (0.6 m) closed just east of Brazos River diversion canal; Pass Cavallo to Aransas Pass, 3 feet (0.9 m).

Corpus Christi to the Rio Grande.—There is no inland route at present between Corpus Christi and the Rio Grande.

Charts covering the Intracoastal Waterway routes along the Atlantic coast and Gulf of Mexico are published by the United States Coast and Geodetic Survey.

The inland waters are covered in the following publications of the Coast and Geodetic Survey:

United States Coast Pilot, Section B, covering the coast and inland waters from Race Point, Cape Cod, to Sandy Hook, including Long Island Sound, New York Harbor, and tributaries.

United States Coast Pilot, Section C, covering the coast and inland waters from Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays, and the inside route from New York to Norfolk.

United States Coast Pilot, Section D (this volume), covering the coast from Cape Henry to Key West.

Inside Route Pilot, New York to Key West.

United States Coast Pilot, Gulf Coast, covering the coast of the Gulf of Mexico.

Additional information concerning the latest controlling depths in the Intracoastal Waterway can be secured at the various United States Engineer district offices along the route.

ROUTE ACROSS FLORIDA

The passage across Florida from the Intracoastal Waterway on the East coast to San Carlos Bay on the Gulf of Mexico by way of the St. Lucie River, St. Lucie Canal, Lake Okeechobee, and the Caloosahatchie River has a controlling depth of about 2 feet (0.6 m). This occurs in that section of the Caloosahatchie River which lies between Moore Haven and Fort Myers. It is reported that improvement work will shortly be undertaken to deepen this section to 6 feet.

Latest information concerning this route can be secured at the United States Engineer district office at Jacksonville, Fla., or at the office of the United States Engineers at Clewiston, Fla.

THE ATLANTIC—GULF SHIP CANAL

The construction of a waterway across northern Florida to connect the Atlantic Ocean and the Gulf of Mexico has recently been begun.

The route of the canal is via the St. Johns River to Palataka; thence in a southern and western direction to the Oklawaha and the Withlacoochee Rivers to deep water in the Gulf of Mexico. When completed the canal will have a depth of 30 feet (9.1 m), mean sea level, and widths as follows: 300 feet to Jacksonville; 400 feet, Jacksonville to Palataka; 250 feet, Palatka to the Gulf of Mexico; from 500 to 1,000 feet in the channel in the Gulf. The total length from deep water to deep water will be about 195 miles.

NEW YORK STATE CANAL SYSTEM

The New York State Barge Canal, known as the Erie Canal, affords an all-water route from the Hudson River on the east to Lake Erie. The canal is free for the use of both commercial and pleasure vessels. The canal was constructed for a depth of 12 feet throughout, but in 1930 the controlling depth was about 10 feet. Barges loaded to about 9½ feet use the canal regularly.

There are 35 locks, the usable dimensions being 300 feet in length, 44½ feet in width, and 12 feet over the sills. The controlling clearance under fixed bridges is about 14½ feet.

If bound to Lake Ontario, the Erie Canal is followed to Three Rivers Point where the canalized Oswego River is entered and followed to Oswego on Lake Ontario. There are 7 locks in the Oswego Canal which is 24 miles in length. The locks are the same dimensions as those in the Erie Canal.

Construction has recently been begun in accordance with the legislation enacted by the 74th Congress which provided for the deepening of that section of the New York State Canal System between Oswego (Lake Ontario) and Waterford (Hudson River) to 14 feet (2.3 m) between locks, raising the level of bridges crossing the canal to provide for a vertical clearance of 20 feet (6.1 m), and for widening at such places and to such dimensions as the Secretary of War may deem advisable.

Troy to St. Lawrence River.—The Champlain Canal, Lake Champlain and the Richelieu River afford an all-water route from Troy to the St. Lawrence River. The size of vessels using this route is limited by the locks in the Chambly Canal (Canadian), which

have usable dimensions of 118 feet length, 22 feet width, and 6½ feet of water over the sills. The locks of the Champlain Canal are the same design as those in the Erie Canal. The distance from Albany to Montreal via this route is 309 statute miles. The Canadian Government requires permits or let-passes from pleasure boats entering Canadian waterways, which may be obtained at their canal statistical offices at St. Johns and Prescot. American vessels when leaving Canada should report at the custom office.

Charts of the Erie Canal, Champlain Canal, Lake Champlain, and Great Lakes are published by the United States Lake Survey Office, Detroit, Mich., and sections of the New York State canals by the Superintendent of Public Works, Albany, N. Y.

Ice.—Navigation in the upper Hudson River and the New York State Canal System is usually obstructed by ice from the middle of December to the latter part of March.

LAKES TO GULF WATERWAY

The **Lakes to Gulf Waterway** by way of the Illinois Waterway System and the Mississippi River affords passage for vessels from Chicago on Lake Michigan to the Gulf of Mexico, a distance of 1,630 statute miles.

The **Illinois Waterway System** permits a draft of 9 feet (2.7 m) to be taken from Chicago to the Mississippi River. The limiting clearance under fixed bridges between Chicago and Grafton, Ill., is 13½ feet (4.1 m) at high water.

Charts of the Illinois Waterway System may be obtained from the district engineer, first district, United States Engineer Office, 333 North Michigan Avenue, room 1325, Chicago, Ill.

The Mississippi River.—This section of the waterway follows the natural and improved channels of the Mississippi River.

Grafton to Cairo.—The project depth is 9 feet (2.7 m) throughout, but this has not been attained between Grafton and St. Louis during very low waters. Between Grafton and the mouth of the Missouri River a channel depth of at least 6 feet (1.8 m) can usually be depended upon, though during periods of very low water the controlling depths may be as little as 5 feet (1.5 m). Except for some delays during periods of very low water, navigation is relatively easy. The least vertical clearance of 44.6 feet (13.6 m), extreme high water, is at Merchants Bridge, St. Louis, Mo.

Cairo to Baton Rouge.—The project depth of the channel is 9 feet (2.7 m). This dimension is greatly exceeded during medium and high stages, and at low stages except across underwater sand bars where channel dredging is necessary. Year-round navigation is easy except during periods of exceptionally low water, when some difficulty is experienced with large tows. The controlling vertical clearance in 56 feet (17 m) above the highest water on record at the fixed bridge at Vicksburg, Miss.

Baton Rouge to the Gulf of Mexico.—This section of the waterway is a ship channel navigated by large ocean-going vessels. Navigation is safe and easy at all seasons. The river current is sluggish for low water flows but during times of high water reaches 6 miles per hour. The effect of tide is felt as far north as Baton Rouge.

On the completion of the bridge now being constructed 2 miles above New Orleans the controlling vertical clearance will be 135 feet (41.1 m) above ordinary high water.

Charts of the Mississippi River may be obtained from the office of the Mississippi River Commission, Box 665, Vicksburg, Miss.

Ice.—Navigation of the Illinois Waterway System is stopped by ice from about December 1 to March 1, and in the section of the Mississippi River between Grafton and Cairo usually between December 15 and February 15.

OTHER RIVER CHANNELS TRIBUTARY TO THE MISSISSIPPI RIVER

Upper Mississippi River.—A 9-foot (2.7 m) project depth has been adopted for the channel improvement of the Upper Mississippi from Grafton to St. Paul and Minneapolis. At present a channel with a controlling depth of 6 feet (1.8 m) is available to Minneapolis.

Charts and information relative to improvements and navigation may be obtained from the Mississippi River Commission, Box 665, Vicksburg, Miss.

Missouri River.—A 6-foot (1.8 m) project has been adopted for the Missouri River from its outlet into the Mississippi River 15 miles above St. Louis to Sioux City. The section between the mouth and Kansas City is now open to navigation.

Charts and information relative to improvements and navigation may be obtained from the United States Engineer Offices, 232 Manufacturers Exchange Building, Kansas City, Mo., and City National Bank Building, Omaha, Nebr.

Ohio River.—A 9-foot (2.7 m) project on the Ohio River has been completed and an excellent channel to Pittsburg, and beyond, is available.

Charts and information relative to improvements and navigation may be obtained from the United States Engineer Office, Custom House, Cincinnati, Ohio.

Red, Arkansas, and Ouachita Rivers.—These rivers flow into the Mississippi River between New Orleans and Cairo. The Red and Arkansas Rivers have not been improved to any great extent, but will accommodate light-draft river boats. The Ouachita River has been canalized to Camden, Ark., and provides a depth of 6½ feet (2.0 m).

Charts and information relative to improvements and navigation may be obtained from the United States Engineer Offices, P. O. Drawer 667, Vicksburg, Miss., and P. O. Box 97, Memphis, Tenn.

Intracoastal Waterway.—Connection with the Intracoastal Waterway is made at New Orleans, La.

Ice.—Navigation in the upper reaches of the Mississippi River and in the Missouri and Ohio Rivers is obstructed by ice in the winter months.

MISCELLANEOUS

Bridge regulations.—Regulations for the lighting of bridges over navigable waters, also for lights on sheer booms, piers, dams, and similar obstructions to navigation are prescribed by the Department

of Commerce. A copy of these regulations (see Publications, page 303) will be sent free of charge to any shipmaster, pilot, or bridge owner on application to the Commissioner of Lighthouses, Department of Commerce, Washington, D. C.

The following regulations have been prescribed by the War Department to govern the operation of drawbridges which are now or may hereafter be constructed across all navigable waterways of the United States discharging their waters into the Atlantic Ocean south of and including Back River, Va., and the Gulf of Mexico, excepting the Mississippi River and its tributaries:

1. The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draw for the passage of vessels.

2. *If the weather conditions are good and sound signals can be heard* when a vessel approaches the drawbridge and desires to pass through the draw, three distinct blasts of a whistle, horn, or megaphone shall be sounded from the vessel when within reasonable hearing distance of the bridge. *When the draw of the bridge can be opened immediately*, the draw tender shall reply by three distinct blasts of a whistle, horn, or megaphone or by three loud and distinct strokes of a bell. *When the draw of the bridge cannot be opened immediately, or when the bridge is open and is to be closed immediately*, the draw tender shall reply by two long distinct blasts of a whistle, horn, or megaphone or by two loud and distinct strokes of a bell.

3. *When weather conditions prevent hearing the sound signals* when a vessel approaches a drawbridge and desires to pass through the draw, signals shall be made from the vessel by swinging in circles at arm's length a lighted lantern at night and a flag by day. *When the draw of the bridge can be opened immediately*, the draw tender shall reply by raising and lowering in a vertical plane a number of times a lighted lantern by night and a flag by day. *When the draw of the bridge cannot be opened immediately or when the bridge is open and is to be closed immediately*, the draw tender shall reply by swinging to and fro horizontally a number of times a lighted lantern at night and a flag by day.

4. When a vessel wishes to pass two or more bridges close together, or crossing a section of the waterway less than 500 feet in length, signals as prescribed above shall be given from the vessel for opening the first bridge, followed at an interval of about five seconds by the same signals for the second bridge, and so on, thus giving at intervals of about five seconds separate signals for each bridge the vessel desires to pass.

5. When two or more vessels are approaching a bridge at nearly the same time from the same or opposite directions with the draw opened or closed, each of these vessels shall signal independently for the opening of the draw, and the draw tender shall reply as prescribed and in turn to the signal of each vessel.

6. Where the bridges are less than 500 feet apart the signals to govern the movements of the approaching vessel shall be given from the bridge nearest the vessel. If that bridge can be opened immediately the bridge tender shall await the reply signals from the other bridges and then give the signal circumstances require. If the nearest bridge cannot be opened immediately, the prescribed signal shall be given the approaching vessel at once, to be followed as soon as possible by the signal from that bridge that the draws are about to open.

7. The draw shall be opened with the least possible delay upon receiving the prescribed signal: *Provided*, That the draw span shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the draw span.

8. When a bridge tender is about to close a draw, he shall sound two distinct blasts of a whistle, horn, or megaphone, or two loud and distinct strokes of a bell.

9. Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a draw span, but all passage

over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

10. These regulations shall be enforced on and after January 1, 1930, and shall supersede the general bridge regulations approved October 12, 1925.

Fishweirs.—Regulations prescribe that fishing structures and appliances in navigable waters of the United States shall be lighted for the safety of navigation, as follows:

The lights shall be displayed between sunset and sunrise. They shall be placed at each end of the structure excepting where the inner end terminates in such situation that there is no practicable navigation between it and the high-water line of the adjacent coast, in which case no inner light shall be displayed. The outer light shall be white and the inner light shall be red. The size, capacity, and manner of maintenance of the lights shall be such as may be specified in the War Department permit authorizing the erection of the structure or appliance.

When several structures or appliances are placed on one line with no navigable passage between them, they will be considered, for lighting purposes, as one structure.

Lighthouse tenders, when working on buoys in channels or other frequented waters, may display a red flag (international signal code flag B) and a black ball at the fore as a warning to other vessels to slow down in passing. Passing vessels will facilitate the work of the Lighthouse Service by a proper observance of the signals.

Special signals for vessels employed in hydrographic surveying.—The following signals have been prescribed for vessels of the United States engaged in hydrographic surveying: By day a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, may carry in a vertical line, one over the other not less than 6 feet apart where they can best be seen, three shapes not less than 2 feet in diameter of which the highest and lowest shall be globular in shape and green in color and the middle one diamond in shape and white.

(*a*) Vessels of the Coast and Geodetic Survey shall carry the above-prescribed marks while actually engaged in hydrographic surveying and under way, including drag work. Launches and other boats shall carry the prescribed marks when necessary.

(*b*) It must be distinctly understood that these special signals serve only to indicate the nature of the work upon which the vessel is engaged and in no way give the surveying vessel the right-of-way over other vessels or obviate the necessity for a strict observance of the rules for preventing collisions of vessels.

(*c*) By night a surveying vessel of the Coast and Geodetic Survey, under way and employed in hydrographic surveying, shall carry the regular lights prescribed by The Rules of the Road.

(*d*) A vessel of the Coast and Geodetic Survey, when at anchor in a fairway on surveying operations, shall display from the mast during the daytime two black balls in a vertical line and 6 feet apart. At night two red lights shall be displayed in the same manner. In the case of a small vessel the distance between the balls and between the lights may be reduced to 3 feet if necessary.

(*e*) Such vessels, when at anchor in a fairway on surveying operations, shall have at hand and show, if necessary, in order to attract attention, a flare-up light in addition to the lights which are, by this regulation, required to be carried.

The wire drags used by the Coast and Geodetic Survey in sweeping for dangers to navigation may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Steamers passing over the drag are requested to change course so as to cross it approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires.

2. GENERAL SAILING DIRECTIONS, OUTSIDE COAST

Vessels may use the following tabulated directions, which give tracks for high-powered steamers plying between New York and the Florida Straits and Dry Tortugas. Directions are also given for entering the Straits of Florida from Providence Channels.

When bound southward the vessels attempt to avoid the full northerly set of the Gulf Stream and therefor either run eastward or westward of the current. When northbound the current of the Gulf Stream is utilized.

Caution.—The courses as tabulated should be used in conjunction with the general information given concerning the currents, depth, and cautions.

NEW YORK TO STRAITS OF FLORIDA

NEW YORK TO CAPE HATTERAS

Courses and distances

(For reverse direction read upwards)	Course (Reverse course in *italics*)		Distance
	True	Magnetic	
1. **Scotland Lightship,** bearing 270° true, distant 0.8 mile. Pass about ¼ mile east of Mohawk wreck lighted bell buoy 2A:	°	*Points*	*Nautical miles*
Direct	180	S. by W	41. 1
Reverse	*0*	*N. by E*	*41. 1*
2. **Barnegat Lightship,** bearing 280° true, distant 1.5 miles:			
Direct	193	S. by W. ⅞ W	285. 0
Reverse	*13*	*N. by E. ⅞ E*	*285. 0*
1a. **Ambrose Channel Lightship,** bearing 5° true, distant 1.0 mile:			
Direct	185	S. by W. ⅜ W	40. 7
Reverse	*5*	*N. by E. ⅜ E*	*40. 7*
2a. **Barnegat Lightship,** bearing 280° true, disant 1.5 miles:			
Direct	193	S. by W. ⅞ W	285. 0
Reverse	*13*	*N. by E. ⅞ E*	*285. 0*
3. **Diamond Shoal Lightship,** bearing 240° true, distant 5.0 miles.			

NEW YORK TO CHESAPEAKE BAY

Courses and distances

(For reverse direction read upwards)	Course (Reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Scotland Lightship,** bearing 270° true, distant 0.8 mile. Pass about ¼ mile east of Mohawk wreck lighted bell buoy 2A:			
Direct	180	S. by W	41. 1
Reverse	*0*	*N. by E*	*41. 1*
2. **Barnegat Lightship,** bearing 280° true, distant 1.5 miles:			
Direct	206½	SW. ¾ S	66. 3
Reverse	*26½*	*NE. ¾ N*	*66. 3*
1a. **Ambrose Channel Lightship,** bearing 5° true, distant 1.0 mile:			
Direct	185	S. by W. ⅜ W	40. 7
Reverse	*5*	*N. by E. ⅜ E*	*40. 7*
2a. **Barnegat Lightship,** bearing 280° true, distant 1.5 miles:			
Direct	206½	SW. ¾ S	66. 3
Reverse	*26½*	*NE. ¾ N*	*66. 3*
3. **Five-Fathom Bank Lightship,** bearing 300° true, distant 2.2 miles:			
Direct	199	SSW. ½ W	21. 5
Reverse	*19*	*NNE. ½ E*	*21. 5*
4. **Fenwick Island Shoal lighted whistle buoy 2,** bearing 260° true, distant 3.9 miles:			
Direct	199	SSW. ½ W	32. 8
Reverse	*19*	*NNE. ½ E*	*32. 8*
5. **Winter-Quarter Shoal Lightship,** bearing 295° true, distant 1.5 miles:			
Direct	213	SW. ⅜ S	68. 0
Reverse	*33*	*NE. ⅜ N*	*68. 0*
6. **Chesapeake Lightship,** bearing 315° true, distant 1.2 miles.			

DELAWARE BAY TO CAPE HATTERAS

Courses and distances

(For reverse direction read upwards)	Course (Reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Overfalls Lightship,** bearing 60° true, distant 1.0 mile:			
Direct	142	SSE. ⅝ E	27. 3
Reverse	*322*	*NNW. ⅝ W*	*27. 3*
2. **Fenwick Island Shoal lighted whistle buoy 2,** bearing 260° true, distant 3.9 miles:			
Direct	199	SSW. ½ W	32. 8
Reverse	*19*	*NNE. ½ E*	*32. 8*
3. **Winter-Quarter Shoal Lightship,** bearing 295° true, distant 1.5 miles:			
Direct	185½	S. by W. ⅛ W	167. 8
Reverse	*5½*	*N. by E. ⅛ E*	*167. 8*
4. **Diamond Shoal Lightship,** bearing 240° true, distant 5.0 miles.			

CHESAPEAKE BAY TO CAPE HATTERAS

The currents may be expected to set about 20° to the right of the wind up or down the coast. High velocities of current may occur either with heavy gales or with long-continued gales from one direction, the estimated maximum velocity near the coast being 2 to 3 knots. In depths of 20 fathoms (36.6 m) or more, 0.5 to 1 knot is regarded as nearer an average of what may be expected. Currents produced by on-shore winds set inshore as well as alongshore.

Courses and distances, Chesapeake Bay to Cape Hatteras

(For reverse direction read upwards)	Course (Reverse course in *italics*)		Distance
	True	Magnetic	
1. **Chesapeake Bay Entrance Lighted Whistle Buoy 2CB**, bearing 45° true, distant 0.3 mile. Pass about ¼ mile northeast of False Cape Lighted Whistle Buoy 4:	°	*Points*	*Nautical miles*
Direct	158	S. by E. ¼ E	71. 0
Reverse	*338*	*N. by W. ¼ W*	*71. 0*
2. **Bodie Island Lighthouse**, bearing 285° true, distant 13.0 miles. Pass about 1½ miles east of Wimble Shoal Lighted Whistle Buoy 6:			
Direct	175	S. ⅛ W	38. 1
Reverse	*355*	*N. ⅛ E*	*38. 1*
3. **Diamond Shoal Lightship**, bearing 240° true, distant 5.0 miles.			

CAPE HATTERAS TO JUPITER INLET LIGHTHOUSE, FLA.

From Diamond Shoal Lightship there are two routes to the Straits of Florida. Most of the regular lines use the route outside of the Gulf Stream. All vessels bound to any port as far south as St. Johns River follow the coast inside the stream.

Cape Hatteras to Jupiter Inlet Lighthouse, Fla., outer route.—*Course 1 to 2.*—This course crosses the Gulf Stream. Under ordinary conditions an average allowance should be made for a 1-knot current setting 45° true for the entire run; with northeasterly winds there may be practically no current, while southerly, and especially southwest, winds may increase it considerably. Observations should be obtained as often as possible.

Course 2 to 3.—There is uncertainty as to the currents that may be expected on this run. It is probable that a Gulf Stream set of 0.5 knot against the vessel and, as the Bahama Bank is approached, possibly some easterly drift also will be experienced. With northeasterly winds it is stated that a southwesterly set of 0.5 knot has been experienced. This and the easterly set mentioned are the dangerous one to guard against in order not to overrun and get too close to Matanilla Shoal. Observations should be obtained as often as possible. The establishment of radio beacons and radio direction-finder stations on the Florida coast has greatly facilitated the fixing of position, and their use should not be neglected by vessels in this area. In case of doubt from about latitude 28° N., vessels can stand west-

ward and watch the lead carefully to pick up the edge of the bank on the Florida coast northward of Jupiter.

Course 3 to 4.—This course leads across the Gulf Stream for Jupiter Inlet Lighthouse. **Matanilla Shoal**, marked by *Matanilla Shoal Lighted whistle buoy M S*, should be given a wide berth. On this course an allowance should be made for a northerly current, averaging about 2¼ knots for the entire run of about 80 miles. It will, therefore, be necessary to shape the course for a position some 8 or 10 miles southeastward of Jupiter Inlet Light to allow for the northerly set. When fixing the position by bearings on the light, keep in mind that while outside the 100-fathom (183 m) curve the vessel is probably in the full strength of the Gulf Stream, where the northerly current may average a velocity of 4 knots. If the light is on the starboard bow, the vessel will be much closer to it than indicated by the distance run between the successive bearings on it.

The courses given in the table, "Cape Hatteras to Jupiter Inlet Lighthouse, Florida, Outside Route", must be corrected for current.

Courses and distances, Cape Hatteras to Jupiter Inlet, Fla., outer route
(Use this table in conjunction with the 4 paragraphs preceding)

	Course		Distance
	True	Magnetic	
1. **Diamond Shoal Lightship,** bearing 240° true, distant 5.0 miles:			
1 to 2	° 188	*Points* S. by W. ⅛ W	*Nautical miles* 129. 0
2. **Latitude 33°00′ N., longitude 75°36′W.:**			
2 to 3	210½	SSW. ⅞ W	348. 5
3. **Latitude 28°00′ N., longitude 79°01′ W.:**			
3 to 4	219	SW. ⅝ S	81. 2
4. **Jupiter Inlet Lighthouse,** bearing 270° true, distant 6.0 miles.			

Courses and distances, Cape Hatteras to Jupiter Inlet, Fla., inner route
(Use this table in conjunction with 3 paragraphs following)

	Course		Distance
	True	Magnetic	
1. **Diamond Shoal Lightship,** bearing 240° true, distant 5.0 miles:			
1 to 2	° 228½	*Points* SW. ¾ W	*Nautical miles* 152. 8
2. **Frying-Pan Shoals Lightship,** bearing 320° true, distant 1.8 miles:			
2 to 3	235½	SW. by W. ⅛ W	152. 6
3. **Latitude 32°00′ N., longitude 80°01′ W.:**			
3 to 4	202½	SSW	64. 9
4. **Latitude 31°00′ N., longitude 80°30′ W.:**			
4 to 5	180	S	90. 0
5. **Latitude 29°30′ N., longitude 80°30′ W.:**			
5 to 6	168	S. by E. ⅛ E	51. 9
6. **Hetzel Shoal lighted whistle buoy 8,** bearing 260° true, distant 3.6 miles:			
6 to 7	170½	S. ⅞ E	103. 8
7. **Jupiter Inlet Lighthouse,** bearing 270° true, distant 6.0 miles.			

Cape Hatteras to Jupiter Inlet Lighthouse, Florida, Inner route.—The courses southward to position No. 6 off *Hetzel Shoal Lighted Whistle Buoy 8* lead in depths of 17 to 20 fathoms (21 to 36 m). In approaching and passing the shoals off Cape Canaveral care must be exercised; the depth should not be shoaled to less than 13 fathoms (22.7 m).

The current of the Gulf Stream may be expected under ordinary conditions to set against the vessel for the entire run with a velocity of about 0.5 to 0.8 knot, the direction of the current following the curve of the coast. It must be remembered, however, that the effect of winds is almost immediately felt on the currents, and that with northerly, and especially northeasterly, winds a current of about 1 knot will set with it along the coast. Southerly, and especially southwesterly, winds increase the velocity of the Gulf Stream.

On course 6 to 7 the 15-fathom (27.4 m) curve is a good guide. The current of the Gulf Stream may be expected under ordinary conditions to have a velocity of about 0.7 knot off Cape Canaveral, increasing to 1.5 or 2 knots off Jupiter Inlet Lighthouse.

STRAITS OF FLORIDA AND THE FLORIDA REEFS

Caution as to currents.—The attention of navigators is called to the fact that most of the wrecks on Florida Reefs have occurred in the case of vessels bound southward, especially at night. They generally occurred on reefs lying about halfway between the lights; and the region of maximum frequency of wrecks was between Carysfort Reef and Alligator Reef, and to a less extent between Fowey Rocks and Carysfort Reef and between Alligator Reef and Sombrero Key. The establishment of intermediate lights has greatly facilitated navigation in this area.

From a consideration of the data it can be stated that nearly all casualties are due to one cause—an underestimate of the strength of the Gulf Stream against the vessel. This leads to two errors in navigation: First, the distance made good over the bottom is less than assumed or indicated by the log, and when skirting the reefs the course is changed too soon for the next light and before sighting it; second, the vessel underrunning her log is closer to the reefs than indicated by the four-point bearing, and this error is greater for slow vessels than for fast ones.

At night, when bound southward and navigating at a safe distance from the reefs between Fowey Rocks and Sombrero Key, it is on the side of safety to assume that the vessel is steaming against a 3 or 4 knot current and from one light to hold a course that will insure clearing the reefs until the next light is sighted. It is also well to remember that near the reefs there is a tidal current, possibly as much as 0.5 knot in places directly on and off the reefs on the rising and falling tides respectively.

On the other hand, when bound northward and following Florida Reefs between Sombrero Key and Fowey Rocks, it is on the side of safety to underestimate the velocity of the Gulf Stream with the vessel; the courses should be laid well clear of the reefs, which is the usual practice. Vessels are rarely lost on Florida Reefs when

bound northward, except when crossing the stream from Habana and making the reefs in misty or rainy weather.

The following are extracts from a report of a stranding:

Rounded Great Isaac Light at a distance of 2¼ miles, steered by compass and log 227° true for 20 miles, and then steered 224° true. By bow and beam bearing Fowey Rocks Light was 12 miles distant when abeam, but on account of the northerly current it was probably about 7 miles. The vessel stranded on the north end of Long Reef, having had a northerly set of 17 miles, or an average of about 2¼ knots for the crossing from Great Isaac Light to Florida Reefs.

Along the keys there is a slight tidal drift, of not more than 0.5 knot, setting on and off the reefs. This current will probably not be noticeable at a greater distance from the reefs than 1 mile. Between the keys, in the passes connecting Hawk Channel and Florida Bay, the current has considerable velocity (3 to 4 knots) in the immediate vicinity of the openings and is felt to some extent, probably, on and beyond the usual sailing line in Hawk Channel. When not influenced by winds the maximum current northwestward into Florida Bay and southeastward into Hawk Channel through the openings between the keys occurs about 1 hour before high and low waters, respectively, in the straits. The northwesterly current is increased by easterly winds and the southeasterly current by westerly winds, due to the effect of these winds in driving out or piling up, respectively, the waters in Florida Bay.

Jupiter to Fowey Rocks.—Vessels follow the coast as close as safety permits—in the daytime at a distance of 1 to 1½ miles to Hillsboro Inlet Lighthouse, then 1½ to 2 miles off—and pass 1 mile eastward of Miami Lighted Whistle Buoy No. 2 and Fowey Rocks Lighthouse. Close attention should be given to the lead, and courses not depended upon entirely and checked frequently. From Jupiter to Lake Worth Inlet the depth should not be shoaled to less than 13 fathoms (23.7 m) and then keep in over 15 fathoms (27.4 m). Southward of Lake Worth Inlet the depths increase so rapidly offshore that the hand lead cannot be depended upon to insure safety for deep-draft vessels.

A narrow ridge, on which least depths of 7 to 12 fathoms (12.8 to 21.9 m) were found and with somewhat deeper water inside it, lies from 1 to 1½ miles from this coast. This ridge has not been closely developed and should be avoided by deep-draft vessels. A vessel with a draft of 23 feet (7.0 m) reports striking at a point 1½ miles from shore and 6 miles southward of Jupiter Inlet Light and another with a draft of 19 feet (5.8 m) at a point 1¾ miles from shore and 18½ miles northward of Fowey Rocks Light. It is suspected that the reported grounding of several steamers on ridges south of New River Inlet is in a measure attributable to the indistinct shore line for which the line of trees along the west edge of the marsh is mistaken, which would place a vessel 1 to 1½ miles inshore of her intended position.

The current of the Gulf Stream may be expected to have a velocity of 1.5 knots from well northward of Jupiter until southward of West Palm Beach, then 1 knot to Hillsboro Inlet, and then 0.7 knot to Fowey Rocks. The velocity increases rapidly offshore.

Fowey Rocks to Sand Key.—Vessels follow the Florida Reefs from 1 to 2 miles off in the daytime, and 2 to 4 miles off at night. The position should be checked on the aids as passed and on the lights

and sectors at night. Care must be taken not to get inside of the line of reefs, beacons (spindles), buoys, or lighthouses, especially when passing parts of the reef that lie well back of the edge and do not break or show near the surface. The color of the water does not always mark the edge of the reefs.

Except in the vicinity of Fowey Rocks, where the 100-fathom (183 m) curve is only about 2 miles outside the reef, the 50-fathom (91 m) curve lies from 2 to 3 miles from Florida Reefs, and this is about the least depth that can be depended upon to insure safety in skirting them. The hand lead is practically of no value as an aid and should not be depended on, but vessels equipped with echo-sounding apparatus should find this equipment of great value in navigating this region.

The reefs are fringed in places with broken ground, which, as a measure of safety, should be avoided by deep-draft vessels where the depths are less than 10 or 12 fathoms (18.3 to 21.9 m).

A number of vessels have been lost on the reefs between The Elbow and Molasses Reef, and extra caution should be observed in this locality. The extremely variable current against the vessel should be carefully considered in determining the position off Carysfort Reef Light from which to shape the course to lead well clear of the Elbow.

Any crossing of the Gulf Stream should be regarded as difficult, on account of the strong current of variable velocity, for which it may not be possible to make a proper allowance, and the abrupt shoaling inside the 100-fathom (183 m) curve. The axis of the Gulf Stream is nearest the reefs from about 10 miles northward of Carysfort Reef Lighthouse to Molasses Reef Lighthouse.

Vessels bound for Habana generally shape the course for that port when abreast of Alligator Reef Lighthouse.

Sand Key to Dry Tortugas.—On the south edge of Florida Reefs between Sand Key and Dry Tortugas there is broken ground with rocky, very uneven bottom, which, like other parts of Florida Reefs, rises abruptly from the deep water of the Straits of Florida. As a measure of safety this broken ground, including the areas with depths less than 10 or 12 fathoms (18.3 or 21.9 m) lying southward and westward of Rebecca Shoal and Dry Tortugas, should be avoided by vessels of the deepest draft. The 50-fathom (91 m) curve is about the least depth that can be depended upon to insure clearing this broken ground when skirting it, except southwestward and westward of Dry Tortugas.

A vessel is reported to have struck an obstruction with about 18 feet (5.5 m) over it lying 11 miles 147° true (SE. ⅞ S. mag.) off Rebecca Shoal Lighthouse; the least depth found in this locality by a careful examination is 5½ fathoms (10 m). A vessel is also reported to have struck an obstruction 2 miles 285° true (WNW. ⅞ W. mag.) off Rebecca Shoal Lighthouse. The area in the vicinity of this shoal was examined with the wire drag, no obstruction being found with the drag set to a depth of 33 feet (10 m).

The currents near the edge of the bank in this locality are variable, being influenced by the winds, by differences in barometric pressure in the Gulf and outside, and by the tides. There are strong tidal currents through the passage westward of Rebecca Shoal; a velocity

of 1.5 knots has been observed in the passage and 1 knot (north and south) on the edge of the bank southward of the passage. The tidal current on and off the edge of the reef should also be considered.

The courses given in the table "Jupiter Inlet Lighthouse to Dry Tortugas" are those recommended for both day and night navigation; and the distances at which they are laid from the reefs should be regarded as a minimum to insure safety.

Courses and distances, Jupiter Inlet Lighthouse to Dry Tortugas

	Course		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Jupiter Inlet Lighthouse,** bearing 270° true, distant 6.0 miles. Pass about 3½ miles eastward of Hillsboro Inlet Lighthouse:			
1 to 2	183½	S. ¼ W	81. 8
2. **Fowey Rocks Lighthouse,** bearing 275° true, distant 1.9 miles. Keep in the white sector of Fowey Rocks Light:			
2 to 3	186	S. ⅜ W	10. 5
3. **Pacific Reef Lighthouse,** bearing 231½° true, distant 4.1 miles. This position is in the white sector of Carysfort Reef Light:			
3 to 4	203	S. by W. ⅞ W	13. 4
4. **Carysfort Reef Lighthouse,** bearing 293° true, distant 2.0 miles. The latter half of this course is in the red sector of Carysfort Reef Light:			
4 to 5	214	SSW. ⅞ W	15. 9
5. **Molasses Reef Lighthouse,** bearing 304° true, distant 2.4 miles. The first half of this course is in the red sector of Alligator Reef Light:			
5 to 6	234	SW. ⅝ W	17. 2
6. **Alligator Reef Lighthouse,** bearing 324°, distant 2.3 miles:			
6 to 7	234	SW. ⅝ W	16. 6
7. **Intersection of edges of red sectors of Alligator Reef and Sombrero Key Lights:**			
7 to 8	255	WSW. ½ W	14. 9
8. **Sombrero Key Lighthouse,** bearing 345° true, distant 2.1 miles:			
8 to 9	254	WSW. ⅜ W	23. 3
9. **American Shoal Lighthouse,** bearing 344° true, distant 2.3 miles:			
9 to 10	259	WSW. ¾ W	20. 4
10. **Sand Key Lighthouse,** bearing 349° true, distant 2.0 miles:			
10 to 11	265	W. ¾ S	41. 7
11. **Rebecca Shoal Lighthouse,** bearing 10° true, distant 13.3 miles:			
11 to 12	289	WNW. ½ W	25. 6
12. **Dry Tortugas Lighthouse,** bearing 45° true, distant 11.4 miles.			

STRAITS OF FLORIDA TO CAPE HATTERAS VIA THE GULF STREAM

On the eastern side of the Gulf of Mexico, for a distance of possibly 100 miles outside the 100-fathom (183 m) curve, southeasterly currents prevail and velocities as high as 2.5 knots have been reported. The Gulf Stream investigations indicated that the strongest current into the Straits of Florida is found near the 1,000-fathom (1,829 m) curve westward of Dry Tortugas, and that velocities of 1.5 to 2 knots are frequent in that locality. Approaching Dry Tortugas from the Gulf should, therefore, be regarded as a difficult run, as a vessel will overrun her log, and observations are the principal guide; currents may be expected at all times, but variations occur both in direction and velocity, due to the season of the year and the winds. Approaching the passage westward of Rebecca Shoal from northward, a number of vessels have stranded on New Ground Shoal, indicating an easterly set.

From Florida Straits to Cape Hatteras vessels follow the Gulf Stream, pass about 12 miles southwestward of Dry Tortugas Lighthouse, about 14 miles southward of Rebecca Shoal Lighthouse, then follow Florida Reefs about 8 miles off and pass Fowey Rocks at a distance of 10 to 12 miles and Jupiter Inlet Lighthouse 15 miles. The velocity of the current varies greatly in different localities and is also subject to sudden changes, due to wind, differences in barometric pressure, and the like, so that no fixed hourly rate can be given. Frequently high velocities will be carried between certain points and suddenly dropping off between others. The position should, therefore, be checked whenever possible by bearings. The ship speed plus supposed rate of current should not be assumed to fix the position. The greatest velocity will be found between Carysfort Reef and Jupiter Inlet, ranging from 2 to 4½ knots.

The courses given in the table "**Straits of Florida to Cape Hatteras**" are those suggested for vessels bound northward via the Gulf Stream. Course 8 to 9 should lead from 6 to 30 miles outside the 100-fathom (183 m) curve and should give a current nearly equal to the average made between Fowey Rocks and Jupiter Inlet Lighthouse.

It is stated that between latitude 30°30′ and 32°30′ N. heavy tide rips will be experienced, indicating a change in the direction of the stream and not an increase in the velocity, and creating in stormy weather a very uncomfortable sea.

When approaching Diamond Shoal great care must be taken to have a correct location for the vessel. The currents are subject to wide variations, as indicated by the observations on the light vessels. At times during both summer and winter the Gulf Stream has great velocity; at other times none will be found, or a southerly set may be experienced with northerly winds. The general direction of the stream is northeast with a velocity of 1 to 2 knots, but on nearing Diamond Shoal Lightship the current is said to set well to the east-northeast and at other times nearly north. Overallowance and this northerly set have been fatal to many vessels. If a northerly gale is encountered between Jupiter and Cape Hatteras, some navigators keep closer inshore to get on soundings before reaching Diamond Shoal.

Courses and distances, Straits of Florida to Cape Hatteras, northbound via Gulf Stream

	Course		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Dry Tortugas Lighthouse,** bearing 45° true, distant 11.4 miles:			
1 to 2	109	ESE. ⅝ E	25.6
2. **Rebecca Shoals Lighthouse,** bearing 10° true, distant 13.3 miles:			
2 to 3	95	E. ⅛ S.	40.6
3. **Sand Key Lighthouse,** bearing 5° true, distant 9.2 miles:			
3 to 4	76	ENE. ½ E	46.4
4. **Sombrero Key Lighthouse,** bearing 346° true, distant 8.6 miles:			
4 to 5	65	NE. by E. ½ E	31.8
5. **Alligator Reef Lighthouse,** bearing 335° true, distant 9.3 miles:			
5 to 6	46	NE. ⅛ N	34.5
6. **Carysfort Reef Lighthouse,** bearing 316° true, distant 9.3 miles:			
6 to 7	23	NNE	27.0
7. **Fowey Rocks Lighthouse,** bearing 290° true, distant 11.4 miles:			
7 to 8	3½	N. ⅛ E	85.5
8. **Jupiter Inlet Lighthouse,** bearing 270° true, distant 15.0 miles:			
8 to 9	2	N. ⅛ E	208.7
9. **Latitude 30°25′ N., longitude 79°40′ W.:**			
9 to 10	25	NNE ¼ E	50.8
10. **Latitude 31°11′ N., longitude 79°15′ W.:**			
10 to 11	46	NE ⅜ E	242.8
11. **Latitude 34°00′ N., longitude 75°49′ W.:**			
11 to 12	23	NNE ½ E	73.3
12. **Diamond Shoal Lightship,** bearing 240° true, distant 5.0 miles.			

ENTERING STRAITS OF FLORIDA THROUGH PROVIDENCE CHANNELS

The greater number of sailing vessels bound to the Gulf of Mexico from ports in Europe, British North America, or the northern Atlantic ports of the United States, and a large number of steamers from European ports, enter the Straits of Florida from eastward through the Providence Channels, which have a least width of 22 miles between Great and Little Bahama Banks.

The point for which a course is shaped, and the first land sighted, is the south point of Great Abaco Island, known as Hole in the Wall. Vessels coming from northward, if at all doubtful of their reckoning, should make latitude 26°30′ N., well eastward of the eastern end of Abaco Island, so that in case the wind falls light or the weather becomes thick they will not be picked up by Elbow Key. At night, in a sailing vessel, if the wind is from southward when in this locality, and the light is not sighted or the reckoning is doubtful, the vessel's head should be kept eastward, as the lead will be of little use to give warning of danger. Near the northeastern end of Great

Abaco Island the currents are strong and variable and have caused many wrecks in the vicinity of Elbow Key.

Caution.—A branch of the North Equatorial Current runs strongly on the eastern side of Bahama Islands, and several vessels have stranded between Hole in the Wall and Elbow Key. The current generally sets north-northwestward; its velocity is about 1.5 knots, increased during southeast winds, but it sometimes sets in an opposite direction.

In the Northeast Providence Channel the currents are variable and the reefs and keys should not be approached too closely in light winds. In the Northwest Providence Channel, between Great Stirrup Key and Great Isaac, the flood sets southward on the Great Bahama Bank and the ebb northward off the bank. In the middle of the channel there is generally but little current, except after northerly winds, when it frequently sets eastward with a velocity of about 1 knot. The tidal current has a velocity of about 1 knot on the banks, setting directly on and off on the rising and falling tide, respectively.

Steamers bound to ports in the Gulf of Mexico, after passing Great Isaac, will find it to their advantage to stand across the Straits of Florida for Fowey Rocks Lighthouse and follow the Florida Reefs into the Gulf. The reefs are so well marked in the daytime, and at night by the red sectors in the lights, that no uncertainty as to the position of a vessel is possible with ordinary care. This route is also shorter than the one along the western edge of Great Bahama Bank and across Salt Key Bank.

Sailing vessels after passing Great Isaac stand along the western edge of Great Bahama Bank for a distance of about 75 to 80 miles and then stand for the northwest end of Salt Key Bank; or, if not over 18-foot (5.5 m) draft, they can cross Salt Key Bank, passing either side of Dog Rocks (30 feet (9.1 m) high) and south of Double Headed Shot Keys, thus avoiding the strength of the Gulf Stream, which is weaker here than on its western side. From Salt Key Bank the wind generally governs whether the vessel bound into the Gulf of Mexico crosses the Straits of Florida so as to make Sand Key Lighthouse, or follows the north shore of Cuba and crosses the straits so as to pass westward of Tortugas.

Vessels of less than 12-foot (3.7 m) draft can stand across the northwest end of Great Bahama Bank after entering the Northwest Providence Channel, but this should not be attempted unless in the daytime, when the rocky patches can be seen so as to be avoided. A vessel using this route will leave the western edge of Great Bahama Bank about 78 miles southward of Great Isaac Lighthouse, and southward of Orange Key.

Through Providence Channels to Great Isaac and Fowey Rocks.—When Hole in the Wall Lighthouse is made, shape the course to pass from 3 to 5 miles southward of it; a narrow bank of soundings with depths of 9 to 12 fathoms (16.5 to 21.9 m) extends 5 miles between the bearings southeastward and east-southeastward from Hole in the Wall. Then make good a 281°30′ true (W. by N. mag.) course for 100 miles, passing 5 miles northward of Great Stirrup Key Lighthouse and to a position near the edge of the bank with Great Isaac Lighthouse bearing 231° true (SW. ½ W. mag.) distant 7

miles. Then round Great Isaac Lighthouse at a distance of about 4 miles in a depth of about 12 or 13 fathoms (21.9 to 23.8 m).

The principal dangers are the *Gingerbread Ground* and the rocks and reefs lying between it and Great Isaac Lighthouse, which have a total length of about 30 miles; and the greatest caution and attention to soundings should be observed in approaching this dangerous locality, as the flood tide sets directly on the reefs, and in places parts of it are only about 1½ miles from the edge of the bank. From westward of Stirrup Keys to eastward of the Gingerbread Ground the northern edge of the bank is clear and the lead a safe guide, and vessels sometimes anchor here during light winds.

From northward of Great Isaac Lighthouse steamers shape the course across the Gulf Stream for Fowey Rocks Lighthouse. On this course an allowance should be made for a northerly current, averaging about 2¼ knots for the entire run. It will therefore be necessary to shape the course for a position some 8 or 10 miles southeastward of Fowey Rocks Light to allow for the northerly set. When fixing the position by bearings on the light, keep in mind that while outside the 100-fathom (183 m) curve the vessel is probably in the full strength of the Gulf Stream, where the northerly current may average a velocity of 4 knots; if the light is on the starboard bow, the vessel will be much closer to it than indicated by the distance run between the successive bearings on it. On account of the strong current and the abrupt shoaling inside the 100-fathom (183 m) curve, the greatest caution should be observed in approaching Fowey Rocks and in fixing the position from which to shape the course southward. (See the caution as to currents in the Straits of Florida on p. 51.)

To stand along the western edge of Great Bahama Bank.—If possible, daylight should be selected for the run.

Having rounded Great Isaac Lighthouse at a least distance of 3 miles, steer 223° true (SW. ¼ S. mag.) for 10 miles to pass outside Eldorado Shoal, depth 10 feet (3.0 m), taking care in the night not to come within the depth of 10 fathoms (18.3 m), or to bring the light to bear northward of 51° true (NE. ½ E. mag.) until the shoal is passed. The course may then be altered more southward to follow the edge of the bank in not less than 10 fathoms (18.3 m) and pass outside Moselle Shoal buoy.

After passing North Bimini the keys must be closely hugged in order to avoid the Gulf Stream, which sometimes comes close to the rocks. A short calm within a mile of the edge of this part of the bank might drift a sailing vessel so far northward as to oblige her to run around Little Bahama Bank and to enter again from eastward. Therefore, instead of attempting to beat along with a light wind it is more prudent to anchor under North Bimini and await a slant of wind to get around the elbow.

In the winter when near Great Isaac, if the weather indications give warning of a northwester, it is advisable for a sailing vessel to remain in the Northwest Providence Channel and be guided by bearings on Great Isaac until the wind draws northward, which it usually does in 24 to 48 hours.

Vessels proceeding westward from Great Bahama Bank should endeavor to strike soundings on the northwest end of Salt Key Bank. Should the wind be scant from westward, they may run in on the

bank on either side of Dog Rocks and pass off southward of the Double Headed Shot Keys; or, should the wind be light and tending to calm, they may anchor on the bank to avoid being set northward. At night vessels had better run down westward of the bank, paying great attention to the lead.

It is advisable for sailing vessels not to stand over for Salt Key Bank until after reaching Orange Key. In the summer months, when light southeasterly winds prevail, a strong northwest current frequently runs into Straits of Florida from Santaren Channel, and vessels meeting with a calm or light airs at this period are sometimes drifted through the straits, even in sight of the keys along the edge of the bank.

Having passed Elbow Key Lighthouse and being clear of Salt Key Bank, the course should be about 233° true (SW. ½ W. mag.) until close over to the coast of Cuba, to avoid the strength of the current. This course should lead toward the peak of Matanzas and about 12 miles northwest of Piedras Key Lighthouse, but this will depend upon where the vessel leaves the bank and the set of the current, which is very uncertain and sometimes strong into the Nicholas Channel. If bound to ports of the United States on the Gulf of Mexico, keep along the coast of Cuba as far west as Mariel, about 22 miles westward of Habana, and then shape a course to pass westward of Tortugas.

Vessels with a fair wind may shorten the passage by crossing over from Salt Key Bank to Sand Key Lighthouse; a Gulf Stream current with a velocity of about 2 knots in a northeasterly direction will be experienced.

To cross Great Bahama Bank.—Vessels of less than 12 feet (3.7 m) draft can stand across the northwest part of Great Bahama Bank from Northwest Providence Channel, but this should not be attempted unless in the daytime, when the rocky patches can be seen so as to be avoided. The distance with a depth less than 4 fathoms (7.3 m) is 70 miles. About half of this distance carries a depth of a little more than 2 fathoms (3.7 m); 15 miles of this is known as the flats or Middle Ground, which has narrow sand ridges and small black heads, between which the vessel must be guided by eye.

Passing 1½ miles northward of Great Stirrup Key Lighthouse, bring the lighthouse to bear 112° true (ESE. mag.), distant 4 miles. Then steer 238° true (SW. by W. ⅛ W. mag.) for 33 miles to the edge of the flats or Middle Ground, which extends across the bank and is about 15 miles wide; allowance must be made for the tidal current. Thence a 217° true (SW. ¾ S. mag.) course for 50 miles will lead to a position 5 or 6 miles southeastward and in sight of Orange Key, and the course continued will lead to the edge of the bank about 12 miles southward of it.

In crossing the flats the eye must be the guide between the numerous white sand ridges and the small black heads, which are easily seen, even in the nighttime, if the weather is clear. Should a vessel enter upon the bank with the first of the flood, she should steer a little more westward, and more southward if she enters on the first of the ebb. Although the water is so shoal and clear, the lead should be kept constantly going, the lead line being marked to feet. If eastward of the track and approaching what is known as Long

Bank, the little heads of sponge and dark fans will become more numerous. In the winter months, should the wind haul southward (a sure indication of a northwester), it is advisable to anchor and await the change instead of beating about among the shoals.

Tides.—Mean high-water interval on the bank is about 8 hours, and the current has a velocity of 1 to 0.5 knot to within a short distance of the north side of the Middle Ground. On the Middle Ground there is little current; and on the south side of the Middle Ground the current is rotary, setting from east to south and west from high to low water, and through north to east from low to high water.

3. OUTSIDE COAST CAPE HENRY TO CAPE LOOKOUT

(Charts 1227, 1229, 1232, 1233)

Cape Henry, on the south side of the entrance to Chesapeake Bay, is a bold range of sand hills, 80 feet (24.4 m) high, with lower ones near the water. On the beach at the cape is Cape Henry Lighthouse, and 340 feet southwestward of it is an unused lighthouse tower. Near the lighthouse are a storm-warning display station and a seacoast telegraph station of the United States Weather Bureau, from which vessels are reported to Norfolk and with which they may communicate by the use of International Code Signals.

Cape Henry Lighthouse, lat. 36°55′34″ N., long. 76°00′27″ W., is an octagonal, pyramidal tower, upper and lower half of each face alternately black and white. The light is group flashing white (group of 3 flashes every 20 seconds) with a red sector, 157 feet (47.8 m) above the water, and visible 19 miles.

The fog signal consists of 2 diaphones operated simultaneously, 1 horn points 77° and the other points 333°. The diaphones sound a 2-second blast, and are silent 18 seconds. If the diaphones are disabled the fog signal is a siren, blast 3 seconds, silent 17 seconds.

A radiobeacon and distance-finding station is operated from the lighthouse. (For description see Light List, Atlantic Coast or H. O. Pub. No. 205.)

Gun-firing practice, vicinity of Cape Henry.—Information is issued in the "Notice to Mariners" when gun firing from Fort Storey is contemplated. The last notice defined the danger areas as lying between the bearings 50° and 140° true from Cape Henry Lighthouse, for a range of 20,000 yards.

Virginia Beach, a summer resort 5 miles southward of Cape Henry, has railroad communication with Norfolk. The buildings are prominent, especially the Cavalier Hotel, and there is a high, black water tank here. A Coast Guard station is located on the beach here. There is a naval radio direction-finder station operating from the Coast Guard station lat. 36°51′10″ N., long. 75°58′33″ W. The towers of the naval radio direction-finder station carry twin fixed red lights at the top. (For description, see H. O. Pub. No. 205.)

From Cape Henry to Cape Hatteras the coast trends southward for 103 miles and is broken by Oregon Inlet. From Cape Henry southward for 11 miles there are woods near the beach, but for the remainder of the distance the coast is a low, narrow strip of land or sand beach, from ⅛ to 2¾ miles wide, separating the ocean from

the extensive interior waters of North Carolina. Currituck Beach, Bodie Island, and Cape Hatteras Lighthouses, Diamond Shoal Lightship, the buoys, and the Coast Guard stations are the principal marks.

The coast between Cape Henry and Cape Hatteras is free from dangers if it be given a berth of 5 miles or more, and along the greater part of it 5 to 9 fathoms (9.1 to 16.5 m) will be found as close as 1 mile from the beach. The shoals lying off this stretch of coast are **False Cape Shoals, Platt Shoals, Wimble Shoals,** and **Hatteras Shoals.** In navigating along this coast in thick weather the closest attention should be paid to the soundings and chart, and even then the navigator is likely to be confused and led into danger in consequence of the irregularities of depth.

About 21½ miles southward of Cape Henry there are two sand hills, one 60 feet (18.3 m) and the other 40 feet (12.2 m) high, called, respectively, "Wash Hill" and "Sheep House Hill." When approaching from southward, the locality resembles Cape Henry and is called "**False Cape.**" Several spots with depths of 14 to 18 feet (4.3 to 5.5 m) lie from ¾ to 1¾ miles offshore from False Cape. A lighted whistle buoy (flashing white light) is moored outside these shoals about six miles from shore.

Currituck Beach Lighthouse, lat. 36°22′25″ N., long. 75°49′52″ W., nearly 34 miles southward of Cape Henry Lighthouse, is a red conical tower. The light is flashing white every 20 seconds (flash 3 seconds, eclipse 17 seconds), 158 feet (45.1 m) above the water, visible 19 miles.

There is a naval radio direction-finder station, lat. 36°17′17″ N., long. 75°47′49″ W., located 5½ miles south of Currituck Beach Lighthouse and near Poyner Hill Coast Guard Station. (For description see H. O. Pub. No. 205.)

Wright Memorial Monument, lat. 36°00′51″ N., long. 75°40′06″ W., about 3¼ miles south of Kittyhawk on the sand hills near the coast, is high and very prominent, and provides a good landmark on this low sandy coast where there are but few prominent objects.

Bodie Island Lighthouse, lat. 35°49′06″ N., long. 75°33′49″ W., 36 miles southward of Currituck Beach Lighthouse, is a conical tower, alternate white and black horizontal bands above granite base. The light is group occulting white (light 2.5 seconds, eclipse 2.5 seconds, light 2.5 seconds, eclipse 22.5 seconds) every 30 seconds, 156 feet (47.5 m) above the water, and visible 19 miles.

Oregon Inlet, about 2 miles southward of Bodie Island Lighthouse, is entered over a shifting bar, the surveyed depth on which has varied from about 6 to 10 feet (1.8 to 3.0 m) or more. When inside the bar, anchorage can be found under the lee of the south entrance point. The tidal currents have considerable velocity, sometimes from 3 to 4 knots, and even 5 knots on the ebb with strong westerly winds. About 4 feet (1.2 m) at high water can be taken from the inlet over the bulkhead into Pamlico Sound through a difficult, shifting channel. There are no aids with the exception of *Oregon Inlet Whistle Buoy*, which marks the entrance. The inlet is used to some extent by local boats, but never by strangers. A ferry crosses the inlet.

Platt Shoals are a number of spots with 4½ to 6 fathoms (8.2 to 11.0 m) over them, lying from 2¼ to 3¾ miles from the beach and from 6 to 9 miles southeastward of Bodie Island Lighthouse. There

is a good channel with a depth of 8 to 14 fathoms (14.6 to 25.6 m) inside this shoal and about 1⅜ miles from the beach. The shoals are about 3½ miles long in a south-southeast direction and are about 1½ miles wide. In easterly gales the shoaler spots are marked by breakers.

New Inlet, which formerly existed in the beach, 10 miles southward of Bodie Island Lighthouse is entirely closed.

In March 1933 a new inlet was cut through the beach between Pea Island and Chicamacomico Coast Guard stations.

Wimble Shoals are a number of ridges extending out from and lying off the shore to a distance of 4 miles, with depths ranging from 3½ to 6 fathoms (6.4 to 11.0 m). The northern end of these shoals is about 15 miles southward of Bodie Island Lighthouse and eastward of the northern end of Chicamacomico Woods. The spot with 3½ fathoms (6.4 m) over it lies about 2⅝ miles from shore, and there are several spots with 4 fathoms (7.3 m) over them inshore of it. In easterly gales the shoaler parts are marked by breakers. *Wimble Shoal Lighted Whistle Buoy 6* moored 6½ miles offshore marks the outer limit of the shoals.

Cape Hatteras, where the coast makes a sharp bend westward, is low and sandy and is marked by Cape Hatteras Lighthouse. About 0.7 mile northward of the lighthouse is a radio direction-finder station, lat. 35°15′59″ N., long. 75°31′18″ W. (for description see H. O. Pub. No. 205). There is a Coast Guard station about 1 mile southward of the lighthouse.

Cape Hatteras Lighthouse, lat. 35°15′17″ N., long. 75°31′16″ W., is a black and white spirally banded tower with a red brick base. The light is flashing white (light 1.4 seconds, eclipse 4.6 seconds), 191 feet (58 m) above the water, and visible 20 miles.

Hatteras Shoals extend nearly 10 miles in a southeasterly direction from Cape Hatteras and consists of a number of irregular shoals, some of which have 4 and 5 feet (1.2 to 1.5 m) on their shoaler parts. The three principal shoals have distinctive names. The Spit extends about 2 miles southeastward from the cape.

Diamond Shoal lies 3 miles southeastward of the cape, has little water over it, and is usually marked by breakers. **Outer Shoal** is at the southeast extremity of Hatteras Shoals and consists of irregular patches with least depths of 5 and 11 feet (1.5 and 3.4 m) over them, which are usually marked by breakers and a wreck or two. **Outer Slue Channel**, the passage between Outer and Diamond Shoals, has a depth of about 3½ fathoms (6.4 m), but as there are several spots with only 14 and 16 feet (4.3 and 4.9 m) over them and as the channel is not marked, it is not safe to pass north of the Outer Shoal. During strong winds the currents set across the shoals with great velocity.

Wrecks on the Outer Shoal usually occur in the case of vessels approaching from southward in thick weather. The difficulty of making a proper allowance for the set of the Gulf Stream, and also the strong currents near the shore and the shoals, may cause considerable error in the reckoning. The lead and Diamond Shoal Lightship with its radiobeacon are the guides for clearing the shoals. When approaching and uncertain of the position, the greatest care should be observed, the lead kept going at frequent intervals until

bottom is found, and care should then be taken not to get into less than 20 fathoms (36 m), or preferably 30 fathoms (55 m). Sailing vessels are cautioned against rounding Hatteras Shoals inside of the lightship, as in case the wind should fail the strong currents are liable to set them on the shoals.

Diamond Shoal Lightship, lat. 35°05′ N., long. 75°20′ W. is moored in a depth of 29 fathoms (53 m) 14 miles 137° true (SE. ¾ S. mag.) of Cape Hatteras Lighthouse. The vessel has a red hull, with "Diamond" on each side, two masts, and a circular gallery under the lens lantern at each masthead. The lighting characteristic is an occulting white light every 20 seconds (light 12 seconds, eclipse 8 seconds), 65 feet (19.8 m) above the water, visible 14 miles; if light on foremast cannot be shown, a similar light will be shown from the mainmast. A fixed white riding light on the forestay indicates the heading of the vessel.

The fog signal is a steam tyfon, blasts 5 seconds, silent interval 55 seconds. If the diaphone is disabled, the ship's bell will be struck by hand rapidly 5 seconds, silent interval 55 seconds. The submarine bell strikes "5", thus: 5 strokes in 9 seconds, silent interval 3 seconds. A station whistle buoy is located 0.5 mile north of the lightship.

A radiobeacon is operated from the lightship. (For description see Light List, Atlantic Coast or H. O. Pub. No. 205.) Wireless messages regarding information of importance in the maintenance of aids to navigation or other urgent matters will be received and transmitted. Call letters WRV.

From Cape Hatteras to Cape Lookout the coast trends generally southwestward for 62 miles and is broken by two inlets. From Cape Hatteras southwestward for 6 miles it is thickly wooded near the beach; between the woods and the beach is a range of sand hills from 10 to 40 feet (3.0 to 12.2 m) high, and for the remainder of the distance the coast is a narrow sand beach, with numerous sand hills, separating the ocean from the extensive interior waters of North Carolina. Cape Hatteras, Ocracoke, and Cape Lookout Lighthouses, Diamond Shoal and Cape Lookout Shoals Lightships, and the Coast Guard stations are the principal aids.

The coast between Cape Hatteras and Cape Lookout is fairly bold and 4 to 7 fathoms (7.3 to 12.8 m) will be found as close as ½ mile from the shore, except off Hatteras Inlet, where shoals extend ont 1¼ miles, and off Ocracoke Inlet, where they make out nearly 1¾ miles.

Hatteras Inlet, 11 miles westward of Cape Hatteras Lighthouse, is entered over a shifting bar, the depth over which varies from about 5 to 12 feet (1.5 to 3.7 m). It is used as a harbor of refuge by small local coasting vessels and fishermen, there being fair anchorage inside the bar in depths of 2 to 3 fathoms (3.7 to 5.5 m). Strangers should not enter without a pilot, as the buoys and lights may not always mark the best water. On account of the shifting nature of the channel, the buoys have been omitted from the chart.

Pilots are on the lookout for vessels and will cross the bar when the sea permits.

The channel over the bulkhead from the inlet to Pamlico Sound is subject to change both in position and depth. It is said to have a

least depth of 4 feet (1.2 m) at high water. The channel is used chiefly by local fishermen. Barney Slue Light is the most important aid.

On the west side of the inlet the shore is a bare sand beach; Hatteras Inlet Coast Guard Station is 1 mile westward of the inlet and the most prominent object in that direction. About 2¼ miles eastward of the entrance is a clump of woods. A white church spire in the village of **Hatteras** is prominent.

Tides.—The range of the tide is about 2 feet (0.6 m) on the bar. In the channels over the bulkhead the height of the water depends upon the direction and force of the wind.

Currents.—The tidal currents in the inlet and the channel through **The Swash** are much influenced by the winds and attain a velocity at times of 2 to 3 knots. The flood current commences nearly 3½ hours after low water and the ebb current about 3 hours after high water.

Ocracoke Inlet, about 26 miles west-southwestward of Cape Hatteras Lighthouse and 15 miles from Hatteras Inlet, is entered over a shifting bar, the depth over which varies, according to the records of the surveys for many years back, from 10 to 12 feet (3.0 to 3.7 m). It is reported that the channel across the bar is moving northward. Strangers should not enter without a pilot, as the buoys may not always mark the best water. Pilots are on the lookout and will board vessels if the sea will permit them to cross the bar.

Inside the entrance there are several channels or sloughs which lead into the shoals lying northward of the inlet. **Teaches Hole Channel**, the main channel into **Pamlico Sound**, has a controlling depth of 6 feet (1.8 m). This channel is well marked by buoys and lights and leads northeastward along the western side of **Ocracoke Island**, westward across the bulkhead, and then northwestward into the sound. Strong currents are experienced, and the buoys marking the channel across the bulkhead must be followed closely. **Wallace Channel** leads northwestward from the inlet and through a formed dredged channel over the bulkhead into **Pamlico Sound**; a least depth of 3½ feet (1.1 m) is in this channel. **Sheep Island Slue**, leading to the westward, is well marked by lights.

Pilotage.—The following are extracts from chapter 104, Revised Laws of North Carolina, 1905, governing Pilotage and Harbor Regulations in the State of North Carolina.

4962. Rates of pilotage for Hatteras and Ocracoke.—Branch pilots of Ocracoke or Hatteras shall be entitled to receive of the commander of such vessel as they may have in charge the following pilotage, namely: For every vessel of sixty and not over one hundred and forty tons burden, from the other side of the bar, at any place within the limits of the pilot ground, to Beacon Island Road, or Wallace's Channel, ten cents for each ton, and the further sum of two and a half cents for each ton over one hundred and forty, and two dollars for each vessel over either of the swashes (that is, over said swashes either to or from Beacon Island Road, or Wallace's Channel, or over any shoal lying intermediate between either of said swashes and Beacon Island Road or Wallace's Channel); for every ship from the mouth of the swash to either of the ports of New Bern or Washington, one dollar per foot, and for every ship or vessel from the same place to the port of Edenton, twelve dollars; and to the port of Elizabeth City, ten dollars; and the same allowance down as up, and outward as inward.

4978. Pilots refused, entitled to pay.—If a branch pilot shall go off to any vessel bound in, and offer to pilot her over the bar, the master or commander of

such vessel if he refuses to take such pilot, shall pay to such pilot, if not previously furnished with one, the same sum as is allowed by law for conducting such vessel in, to be recovered before a justice of the peace, if the sum be within his jurisdiction: *Provided*, That the first pilot, and no other, who shall speak such vessel so bound in shall be entitled to the pay provided for in this section.

4980. Rates of pilotage annexed to commission.—The commissioners of navigation for the several ports of this State shall annex to the branch or commission, by them given to each pilot, a copy of the fees to which such pilot is entitled.

Ocracoke Lighthouse, lat. 35°06′32″ N., long. 75°59′11″ W., is a white tower, near a clump of woods on the western part of Ocracoke Island, 2.2 miles north of Ocracoke Inlet. The light is flashing white every 30 seconds (flash 5 seconds, eclipse 25 seconds), 75 feet (22.9 m) above the water, and visible 14 miles.

Ocracoke village and **Ocracoke Inlet** are frequented by numerous fishing vessels. Supplies in limited quantities are obtainable. Gasoline in considerable quantities may be obtained at any time. There is a hotel open all the year. Mail and passengers are transported daily by boat to Portsmouth and Atlantic. There is motor bus connection between Atlantic and the railhead at Beaufort. Boats also run at intervals to Washington, N. C. Telegrams to the mainland are forwarded over Government telephone via Hatteras Weather Bureau. Repairs to boats are limited.

The best anchorage is in the channel off the village of Ocracoke, from just below the lower wharf to within 200 yards of the Coast Guard station; the depths range from 8 to 18 feet (2.4 to 5.5 m). This anchorage is unsafe in winds from north-northeast around to northwest. The holding ground is poor.

Silver Lake, a circular basin in which there is a depth of 3½ feet (1.1 m) (mean low water), affords anchorage for small boats. The entrance channel has a depth of 5 feet (1.5 m) and leads in between a stone breakwater and a fish house which lies to the southward. The outer end of the breakwater is marked by a light. The docks in the basin have depths of 3½ feet (1.1 m) at their faces.

Portsmouth is a post village on the west side of Ocracoke Inlet. The Coast Guard station is the largest building and is nearest the inlet. A spire in the village is a prominent landmark.

Tides.—The range of tide is about 2 feet (0.6 m) over the bar and about 1 foot (0.3 m) at Ocracoke. In the channels over the bulkhead the height of the water depends upon the direction and force of the wind.

Currents.—The currents in the inlet and the channels over the bulkhead are much influenced by the winds. The ebb current usually has a greater velocity than the flood, sometimes attaining a velocity of 2 to 2½ knots. The flood current commences nearly 3½ hours after low water and the ebb current about 3 hours after high water.

Cape Lookout is the extremity of a long and very narrow strip of sand beach projecting into the sea from the sharp angle of the coast which forms the point of division between Raleigh and Onslow Bays. The land near the cape is low, with sand hills from 10 to 40 feet (3.0 to 12.2 m) high; the cape is, however, readily identified by Cape Lookout Lighthouse, which can be seen at a distance of about 13 miles on a clear day.

Cape Lookout Lighthouse, lat. 34°37′21″ N., long. 76°31′30″ W., is a black and white, diagonally checkered tower. The light is group flashing white every 15 seconds (flash 2 seconds, eclipse 2 seconds, flash 2 seconds eclipse 9 seconds), 156 feet (47.5 m) above the water and visible 19 miles.

There is a radiobeacon at the lighthouse. (For description see Light List, Atlantic Coast.)

There is a naval radio direction-finder station, lat. 34°36′11″ N., long. 76°32′18″ W., 1.3 miles south-southwest from Cape Lookout Lighthouse. (For description see H. O. Pub. No. 205.) The two radio towers are prominent landmarks.

Cape Lookout Shoals extend 8¼ miles south-southeastward from the cape, their outer end, with a depth of less than 18 feet (5.5 m), lying 10 miles 165° true (S. by E. mag.) of Cape Lookout Lighthouse. The greatest width of the shoals is about 1¾ miles, and the depth over them ranges from 2 to 18 feet (0.6 to 5.5 m). Breakers and depths less than 3 feet (0.9 m) extend northward to latitude 34°32′ N. **Lookout Breakers** is the name give nto the ridge o nthe shoals and lies about 8 miles from the lighthouse and 3 miles from the lighted bell buoy (flashing red) which marks the southern end of the shoals. Outside of Lookout Shoals proper and the buoy are two irregular shoals with 4¾ fathoms (8.6 m) over them, which will be avoided by passing near the lightship. In thick weather always use the lead, and if uncertain of the position, do not go into a less depth than 14 fathoms (25.6 m). **Cape Lookout Slough** is a channel across Cape Lookout Shoals. It extends about north and south and has a depth of 10 feet (3.0 m). Its northern and southern ends are marked by buoys.

During the fishing season, from September 20 to December 20, these buoys are replaced by lighted buoys.

Cape Lookout Shoals lighted whistle buoy, lat. 34°18′ N., long. 76°24′ W. is moored in 90 feet (27.4 m), 9.5 miles south-southeast from the outer end of the shoals, 20 miles, 163° true (S. by E. ⅞ E. mag.) from Cape Lookout Lighthouse. The light is group flashing white every 12 seconds (3 flashes 1 second each, 2 eclipses 1 second each, 1 eclipse 7 seconds).

Lookout Bight is on the west side of Cape Lookout and affords good anchorage for large vessels, except with winds from south through west to northwest.

A breakwater has been constructed at Cape Lookout, 306° true (NW. ½ W. mag.) from Cape Lookout Coast Guard Station. In 1935 it was visible above low water for a distance of 4,800 feet. Vessels are advised to use care in the vicinity. **Cape Lookout Breakwater lighted bell buoy no. 2** marks the outer end of the breakwater about 1⅞ miles 262° true (W. ⅜ S. mag.) from Cape Lookout Lighthouse. When finally extended to its project length the breakwater will form a harbor of refuge with protection from all winds.

The controlling depth of **Harbor of Refuge** entrance was 42 feet (12.8 m), June 1934.

The anchorage is northward or northeastward of Wreck Point with Cape Lookout Lighthouse bearing between 86° true (E. mag.) and 109° true (ESE. mag.), in 5 to 6 fathoms (9.1 to 11.0 m). A limited number of small vessels of about 9 feet (2.7 m) or less draft can anchor, with shelter from all winds, inside the hook, on which

there are a number of huts; but the width of the anchorage, with depths of 10 to 18 feet (3.0 to 5.5 m), is only about 200 yards. To anchor inside the hook, pass 75 yards eastward and southward of the east end of the spit, 100 yards eastward of the huts, and anchor in the cove 200 yards southeastward of the huts.

When eastward of Cape Lookout Shoals, the greatest difficulty in making the anchorage in Lookout Bight is in the distance which must be run southward of the cape to clear the shoals. In easterly gales the shoals are marked by breakers, and when westward of them the sea will be somewhat broken. When westward of Cape Lookout Shoals, do not shoal the water to less than 8 fathoms (14.6 m) until Cape Lookout Lighthouse bears eastward of 41° true (NE. mag.). Then give the western side of the cape a berth of over 1 mile, passing well westward of the lighted bell buoy marking the end of the unfinished breakwater. When northward of the lighted bell buoy and Cape Lookout Lighthouse bears 105° true (ESE. ¼ E. mag.), steer for it and anchor as recommended above.[1]

4. WATERWAYS FROM NORFOLK TO ALBEMARLE SOUND

(Charts 406, 452, 1222, 1227, 1228, 3252)

Inside the remarkable line of long, low, and narrow islands forming the seacoast of Virginia and North Carolina from Cape Henry to Cape Lookout, the North Carolina Sounds, a series of connected navigable bodies of water, lie between the islands and the mainland.

The North Carolina Sounds are connected with Norfolk by two waterways, each extending from the Elizabeth River to Albemarle Sound. Both waterways are sections of the Intracoastal Waterway and, being Government owned, are free of tolls. There are no fixed bridges; there is a vertical clearance of 145 feet (44.2 m) under an aerial transmission line crossing the Southern Branch of the Elizabeth River.

Norfolk to Albemarle Sound.—The main and better route, although somewhat exposed for small boats encountering rough water in North Landing River, is through the **Albemarle and Chesapeake Canal, North Landing River, Coinjock Canal,** and **North River.** This is a sea-level waterway, with a tidal guard lock at Great Bridge, Virginia. The distance from the entrance to the South Branch of the Elizabeth River at Norfolk to the lighted bell buoy at the entrance to Alligator River on the south side of Albemarle Sound is about 70 miles. The controlling depth was 11 feet (3.4 m), January 1936. The project depth is 12 feet (3.7 m). The minimum horizontal clearance is 45.9 feet (14.0 m) through the Norfolk and Southern Railroad bridge at Great Bridge, Va., on the Albemarle and Chesapeake Canal.

The second route, through **Deep Creek, Dismal Swamp Canal,** and **Pasquotank River,** offers a shorter passage to the cities at the western end of Albemarle Sound and is recommended as a more protected waterway for small craft passing to Albemarle Sound. The Dismal

[1] The course of 105° true given above will clear the outer end of the breakwater when completed to its full length. In 1935 there as no obstruction reported north or west of the breakwater buoy, and the anchorage could be entered by giving the buoy a berth of 150 yards and then approaching the light on any bearing between 86° and 109° true, as noted above.

Swamp Canal is a summit-level section extending between Deep Creek, Va., and South Mills, N. C., and is controlled by a lock at each of the terminals. The distance to the lighted bell buoy at the entrance to Alligator River on the south side of Albemarle Sound is the same as that by way of the Albemarle and Chesapeake Canal route. The project depth of 9 feet (2.7 m) is being maintained. The minimum horizontal clearance is 37 feet (11.3 m) in the lock at South Mills.

Navigation is practicable throughout the year in both of the above-mentioned routes.

REGULATIONS

The following Regulations have been prescribed by the Secretary of War to govern the Use, Administration, and Navigation of the Intracoastal Waterway from Norfolk, Va., to Cape Fear River, N. C., and the waterway from Norfolk, Va., to the sounds of North Carolina, including the Dismal Swamp Canal.

1. Authority of canal or waterway officers.—The movement of all boats and floating things in the dredged cuts of the natural waterways, in the canal cuts, and in the locks shall be under the direction of the officers of the Corps of Engineers, U. S. Army, detailed in charge of these works, and their authorized assistants.

2. Commercial statistics.—Masters or clerks of boats shall furnish the lock keeper at the entrance lock, in writing, upon blanks furnished for the purpose, such statistics of passengers and cargo as may be required. Boats will not be allowed to proceed through the canal until these statistics shall have been furnished. Where vessels are proceeding through a portion only of the waterway and have not passed or do not expect to pass Great Bridge, Va., the masters or clerks of these vessels shall file similar commercial data with the keeper of the first United States bridge passed on the waterway.

3. Signals.—(*a*) All boats desiring to use the locks shall signal for the same by two long and two short blasts of the whistle.

(*b*) Boats approaching other boats shall give the signals required by the Rules and Regulations for the Government of Vessels, adopted by the Board of Supervising Inspectors.

(*c*) The signals for boats desiring to pass bridges shall be those prescribed in the Rules and Regulations to Govern the Operation of the Drawbridges crossing all navigable waterways of the United States discharging their waters into the Atlantic Ocean south of and including Back River, Va., and the Gulf of Mexico, excepting the Mississippi River and its tributaries, approved by the Acting Secretary of War October 11, 1929.

(*d*) When the lock at Great Bridge, Va., is available for use, a green light will be displayed. When the lock is not available, a red light will be displayed.

(*e*) The locks at Deep Creek, Va., and South Mills, N. C., use a combination semaphore and light in signaling. When the lock is available for use, a white light and semaphore will be displayed. When the lock is not available, a red light and semaphore will be displayed.

4. Right-of-way.—Rafts and tows must give to single vessels the side demanded by a proper signal and be managed in such a manner as not to obstruct or interfere with the passing of boats.

5. Precedence at locks.—Ordinarily the boats or tows arriving at the locks shall take precedence in order of their arrival; but in all cases boats and barges belonging to the United States, or employed upon public work, shall have the precedence over all others; passenger boats shall have precedence over freight boats; individual boats over tows, and vessels over rafts. Small craft will not be granted separate lockage when larger boats are awaiting lockage, and they will be required to lock through with other boats. Rafts shall have one lockage in their turn, except where there are two or more rafts together at a lock, in which case no part of a raft shall pass the lock until the whole of the raft or rafts preceding it shall have passed. In all cases the order of actual entry shall be determined by the lock keeper.

6. Size of vessels and rafts.—The lock chamber at Great Bridge, Va., is 75 feet wide and 600 feet long. The lock chambers at Deep Creek, Va., and South Mills, N. C., are 39 feet wide and 250 feet long. All vessels, rafts, or other craft attempting to use a lock must have such clearance inside these limits as to permit of free and safe operation during lockage. Rafts of larger dimensions than indicated above shall not attempt to enter the locks, and if it is necessary to reduce the size of a raft in order to pass it through a lock, such operations shall not be permitted to block up the entrance to a lock or the approaches thereto.

7. Entrance to locks.—No boat or floating craft shall enter the locks from either direction without permission.

8. Draft.—No boat, barge, or vessel of any kind shall be allowed to enter the locks drawing more water than is shown by the gages to exist over the miter sills; and any boat making such attempt shall not delay other boats, by lightering cargo, but, if directed by the lock keeper shall withdraw so as to leave the entrance unobstructed.

9. Loss of turn.—Boats that fail to enter the locks with reasonable promptness, after being authorized to do so, shall lose their turn.

10. Protection of lock gates.—No boats will be permitted to enter or leave the locks until the lock gates are fully in the gate recesses, and the lock keeper has ordered the boat to start.

11. Mooring in locks.—Vessels when in the locks shall be securely moored by bow and spring lines to the snubbing posts provided for that purpose, and the lines shall not be let go until signal is given for the vessel to leave.

12. Handling gates.—No one not employed by the United States for the purpose will be allowed to move any gate or valve belonging to the canal.

13. Projections from vessels.—No vessel carrying a deck load which overhangs or projects over the side of the said vessel will be permitted to enter or pass through any of the narrow parts of the waterway.

The sides of all craft attempting to enter the locks must be free from projections of any kind that might injure the walls, gates, or other parts of the locks. All vessels entering the locks must be provided with and must use suitable fenders.

14. Stopping in waterway.—Whenever it becomes necessary for a boat, barge, raft, or other floating craft to stop in any of the land cuts or other narrow parts of the waterway, it shall be securely fastened to one bank and as close to the bank as possible; this shall be done only at such a place and under such conditions as will not obstruct or prevent the passage of other vessel or crafts.

When thus tied up, all boats or barges must be moored by not less than two lines each, and rafts at such close intervals as may be necessary to insure their not being drawn away from the bank by winds, currents, or the suction of passing vessels. All towlines shall be drawn up short so that the different vessels shall be as close together as possible. No boat or sections of a raft shall be thus tied up abreast of another.

Lights shall be displayed in accordance with the provisions of the Federal Pilot Rules.

No vessel, even if fastened to the bank as just prescribed, shall be left without a sufficient crew to care for it properly.

Such stoppages shall be only for such period as may be necessary and no vessel or craft will be allowed to use any portion of the waterway as a permanent or semipermanent mooring place without permission from the officer in charge.

At no point in any of the land cuts, except at a regular established landing or wharf, will any boat or barge be permitted to be loaded or unloaded without written permission secured in advance from the officer in charge of the waterway.

Masters and pilots in charge of vessels or tows will be held to a strict accountability that the approaches to the locks are not at any time obstructed by barges or rafts awaiting lockage or that have passed through the locks.

In the wider parts of the waterway, vessels may anchor only when necessary and then only in such places and in such manner as will cause the least obstruction to the passage of other vessels or craft.

The building and assembling of a raft in the waterway will be permitted only upon special authority obtained from the officer in charge and under such conditions as he may prescribe.

15. **Speed.**—No vessel more than 100 feet in length and no vessel having a tow shall proceed through any of the land cuts at a greater speed than 10 miles per hour. Vessels 100 feet or less in length shall not exceed a speed of 10 miles per hour in any of the canal cuts of the waterway.

Upon approaching and passing through drawbridges all boats shall slacken speed to 2 miles per hour, or even less if that be necessary to pass through the bridge without colliding with it or its fenders.

In the narrow parts of the waterway, all vessels upon approaching other vessels or craft proceeding in the opposite direction or tied to the bank shall slacken speed to not exceeding 3 miles per hour so as to allow them to pass in safety and without collision.

16. **Handling of tows.**—Tows must be arranged or grouped for passage through the locks before entering. While thus engaged in preparing for passage they must leave room for boats to enter or leave the locks. All boats engaged in towing through the canal, vessels not equipped with a rudder, whether light or laden, shall use two towlines and shorten them to the greatest extent possible, so as to have full control of their tows, and thereby avoid accident while meeting or otherwise passing other craft. Boats that are towing vessels provided with rudders need use but one towline, but the line between the towboat and the first vessel or barge of the tow, or between subsequent barges or vessels must not exceed 100 feet in length.

17. **Rafts.**—Rafts will be permitted to navigate the waterway only if assembled according to one of the methods hereinafter prescribed.

(*a*) **Sack or bag and dog rafts.**—The passage of "bag" or "sack" rafts, "dog" rafts or of loose logs into and through any portion of the waterway is prohibited.

(*b*) **Logs or piles.**—Where the word "logs," occurs in these regulations it is to be understood to refer to all timber twenty-five (25) feet and less in length whatever the purpose for which it may be intended.

All timber longer than twenty-five (25) feet in length will be considered as "piles", whatever the purpose for which it may be intended.

(*c*) **Assembling rafts.**—Rafts shall be made up in sections not exceeding twenty-five (25) feet in width. The logs or piles in each section shall be so placed that their lengths will be in the direction of towing, and all the logs or piles (other than boom logs or piles) in a section shall be approximately of the same length.

All sections of rafts composed of logs shall be assembled either according to Plan A or Plan B, which plans are described below and are illustrated on the drawing entitled "Methods of Assembling Rafts for Transportation through Inland Waterways", which drawing is to be considered as a part of these rules and regulations.

All sections of rafts composed of piles shall be assembled either according to Plan A or Plan C, which plans are described below and are illustrated on the drawing entitled "Methods of Assembling Rafts for Transportation through Inland Waterways", which drawing is to be considered as a part of these rules and regulations.

Where the use of chains is prescribed in the following rules for assembling rafts, wire rope may be substituted therefor, provided the wire rope so used is of sufficient strength to resist the stresses brought upon it in towing the raft. Under no circumstances shall a wire rope of smaller diameter than one-half inch be used.

(*d*) **Plan A.**—Sections assembled according to this method shall be composed entirely of logs or piles of approximately the same length, and arranged with the ends of the logs or piles approximating to a straight line perpendicular to the lengths of the logs or piles. Boom logs or piles are not required.

The logs or piles in a section shall be fastened together by two chains, one chain near the front end of the logs or piles and the other near the rear end of the logs or piles.

In sections composed of logs the chains shall be placed between 2 and 3 feet from the ends of the logs, and in sections composed of piles, between 3 and 5 feet from the ends of the piles.

Each chain shall pass completely around each log or pile, not an outside log or pile, and shall pass from one log or pile to both adjacent logs or piles on top of the raft. Each chain shall pass once and a half times around each outside log or pile, the end of the chain passing under the outside log or pile and the next adjacent log or pile and coming up between the second and third

logs or piles, and being there securely fastened to the other part of the chain that passes over the space between the second and third logs or piles.

Each chain shall be fastened to each log or pile by not less than one dog, the dog being constructed like a staple and being driven into the top of the log or pile and in such manner that each end of the staple will pass through a separate part of the chain.

The sections shall be placed one behind another with as small intervals as are practicable and shall be coupled to each other with two couplings, one coupling being on each outside log or pile.

Each coupling shall consist of a chain passing through a hole bored not less than 2 feet from the rear end of the outside log or pile of a section and extending to and through a similar hole bored not less than 2 feet from the forward end of the corresponding outside log or pile of the section immediately astern. The ends of the coupling shall be brought together and be secured to each other by a suitable shackle, clevis, dog, link, lashing, or knot. Or, if preferred, a coupling may consist of a chain making one or more turns and one or more hitches at a point not less than 2 feet from the rear end of an outside log or pile and secured thereto against slipping by two or more dogs, and extending to the forward end of the corresponding outside log or pile of the section immediately astern to which it shall be fastened at a point not less than 2 feet from its forward end by one or more turns and hitches and secured against slipping by two or more dogs.

(*e*) **Plan B.**—Sections assembled according to this method shall consist of three strong bouyant boom piles and two tiers of logs, all of which shall be self-buoyant. All logs in a tier shall be of approximately the same length. The length of each boom pile shall be at least equal to the combined lengths of the two tiers of logs in the section.

Each section of two tiers shall be enclosed by two boom piles so placed as to form the sides of the section and a similar boom pile shall be placed in the middle of the section parallel to the outside boom piles. The logs in each tier shall be placed parallel with the boom piles and shall be so arranged that the ends of the logs will approximate to a straight line perpendicular to the length of the boom piles.

About 2 feet from the front end of each tier of logs the sections shall be held together by a chain passing across the top of the raft and fastened to both outside boom piles by making a complete turn around each, and being fastened to each, either by two staple dogs or by two ring dogs. One of these dogs shall be driven near the end of the chain and the other in the part of the chain where it passes over the outside boom pile. Each of these chains shall be securely fastened to the middle boom pile and to each of the logs over which it passes, by a staple dog or a ring dog.

In addition to the chains mentioned the sections shall be held together by lifting poles placed transversely across the sections, two lifting poles being placed at or near the middle of the length of each tier of logs. Each of the lifting poles shall extend from one of the outside boom piles to and across the middle boom pile and shall be securely fastened to each of the boom piles or logs, which it crosses by a suitable ring dog. The lifting poles shall be of ample strength to support the logs in the tiers and to resist the strains of towing.

The sections shall be placed one behind another with as small intervals as are practicable, and each section shall be coupled to the section next in front of it by two couplings, one coupling being on each outside boom pile. The couplings shall be similar to those described for use with plan A.

(*f*) **Plan C.**—Sections assembled according to this method shall consist of piles of approximately the same length and so placed that their front ends shall be in a line approximately perpendicular to the lengths of the piles. The piles shall be placed alternately butt forward and point forward.

About 5 feet from its forward end, each section shall be securely fastened together by a chain passing over all the intermediate piles and at least once around the outside piles. Each loose end of this chain shall be securely fastened to the part passing over the raft, and the chain shall be securely fastened to each outside pile by not less than two staple dogs or ring dogs. Where this chain passes over the interior piles it shall be securely fastened to each by a staple or ring dog.

In addition to the chain mentioned, each section shall be held together by a lifting pole and chain placed transversely across the section near the middle

of its length. This lifting pole shall be of ample strength to support the piles in the section and to resist the strains of towing. Its diameter shall not be less than the average diameter of the piles in the section, and its length shall be sufficient to reach completely across the section.

The chain used in connection with the lifting pole shall be securely fastened thereto near each end of the lifting pole by one or more turns or hitches or by staples or ring dogs. This chain shall be woven into the section by running it from the end of the lifting pole under the outside pile of the section, thence up and over the lifting pole, thence down and under the next pile, thence up and over the lifting pole, and so on across the section, passing down and under each pile and up and over the lifting pole at each interval between adjacent piles.

The sections shall be placed one behind another with as small intervals as are practicable, and each section shall be coupled to the section next in front of it by two couplings, one coupling being on each outside pile. The couplings shall be similar to those described for use with plan A.

(*g*) **Dogs and chains.**—All dogs and chains used in assembling rafts shall be in good condition and shall be of ample size and strength to accomplish their purposes.

(*h*) **Towing rafts.**—When rafts are towed through the land cuts and other narrow parts of the waterway, the rafts shall not be more than one section wide. When towing through the wider parts of the waterway, the rafts may be made up two sections abreast, but the two columns of sections shall be fastened together at the front end and at the rear end and at intervals of not exceeding 50 feet by additional chains so fastened as to prevent the columns from separating from each other.

Should it at any time be noted that any staple, dog, chain, or lifting pole has become loosened, it shall be the duty of the master of the towboat, or other person in charge of the raft, to stop the towboat as soon as practicable and to repair the damage; and in order that any loosening of the raft may be quickly ascertained the master of the towboat, or other person in charge of the raft, shall thoroughly inspect it, or cause it to be inspected, at frequent intervals.

All rafts shall carry sufficient men to enable them to be managed properly and to keep them from being an obstruction to other craft navigating the waterway.

(*i*) **Inspection of rafts.**—On approaching the locks at Great Bridge, Va., Deep Creek, Va., or South Mills, N. C., the towboat and tow shall be stopped in order that the raft may be inspected and the logs be counted by an agent of the officer in charge of the waterway. Masters of boats towing rafts, or persons in charge of same, will be required to give every facility for the inspection of the rafts and for the counting of the logs and shall at this time report such commercial data as is required by paragraph 2 of these rules and regulations.

As one method of facilitating the inspection of rafts and the counting of logs, each master of the towboat, or person in charge of a raft, shall prepare in advance a statement giving in detail the total number of logs or piles in the raft and the number in each section.

If at any inspection, it is found that the raft is assembled otherwise than is prescribed in these rules and regulations, the rafts will not be allowed to proceed further through the waterway and shall immediately be removed from the waterway or be so placed that it will not interfere with the navigation of other craft until all irregularities shall have been corrected.

When rafts are to be made up and towed in the portions of the waterway between South Mills, N. C., and Albemarle Sound, N. C., and that portion of the inland waterway between Great Bridge, Va., and the crossing of the New Holland, Higginsport & Mt. Vernon Railroad, the owners of the logs will notify the United States Engineer Office at Norfolk, Va.; or, if between the crossing of the New Holland, Higginsport & Mt. Vernon Railroad and Cape Fear River, N. C., the United States Engineer Office at Wilmington, N. C., should be notified at least seven (7) days before it is expected to move the rafts, giving the names of owners and location of rafts. Such inspection of the rafts will be made as may be deemed necessary. Any raft in tow will be stopped if necessary for making the required inspection.

(*j*) **Lost logs.**—Should any log be lost from a section or any section be lost from a raft, the fact must be promptly reported by the master of the towboat, who shall state as definitely as possible the exact point at which the loss occurred.

In case logs are lost in Deep Creek, the Dismal Swamp Canal, or Turners Cut, the reports required of masters of towboats above must be made in writing to the nearest lock master, and by mail to the United States Engineer Office at Norfolk, Va.

In case logs are lost in the waterway north of the crossing of the New Holland, Higginsport & Mt. Vernon Railroad, the report required of masters of towboats above, must be made, in writing, to the bridge keeper of each United States bridge subsequently passed; to each canal office he may pass; and, by mail, to the United States Engineer Office at Norfolk, Va.

In case logs are lost in the portion of the waterway between the crossing of the New Holland, Higginsport & Mt. Vernon Railroad and Cape Fear River, N. C., the above report shall be made to the United States Engineer Office at Wilmington, N. C.

(*k*) **Buoyancy of logs.**—No section of a raft will be permitted to be towed through the waterway, or any portion thereof, unless the logs in the section float sufficiently high in the water to make it evident that the section will not sink en route.

18. Damage.—Masters of tugs or other persons in charge of tows shall avoid damaging canal revetments, lock piers, bridge fenders, and displacing or damaging buoys, stakes, spars, or other aids to navigation, or the pedestals of any range light or other aid to navigation. They shall keep careful watch when passing bridges and aids to navigation and should any fenders be accidentally damaged or should an aid to navigation be accidentally damaged or displaced, they shall report the fact at the earliest possible moment to the nearest Government lock keeper, bridge keeper, or canal office, and by mail, if north of the crossing of the New Holland, Higginsport & Mt. Vernon Railroad, to the United States Engineer Office at Norfolk, Va.; and if south of said crossing, to the United States Engineer Office at Wilmington, N. C.

19. Refuse in waterway.—Attention is invited to the provisions of section 13 of the River and Harbor Act of March 3, 1899, printed below.

The passing of coal from flats or barges to steamers while in the lock is prohibited.

20. Trespass on canal property.—Trespass on canal property or injury to the canal banks, locks, bridges, piers, fences, trees, houses, shops, or any other property of the United States, pertaining to the canal, is strictly forbidden. No business, trading, or landing of freight or baggage will be allowed on or over canal piers, bridges, or lock walls.

21. These regulations shall take effect and be in force on and after the date of approval hereof and all regulations or parts of regulations applying to the above-named waterways in conflict therewith are hereby revoked to take effect on that date.

Approved May 31, 1933.

GEO. H. DERN,
Secretary of War.

NOTE.—Copies of these regulations are posted in the offices at the canal locks.

ALBEMARLE & CHESAPEAKE CANAL ROUTE

Southern Branch of Elizabeth River (chart 452) forms the northern approach to the two canals which afford passages from Chesapeake Bay to the inland waters of North Carolina. This branch is of considerable commercial importance. There are several large lumber mills and other manufactories at which vessels load, and the commerce using the canals also passes through the branch. Between the navy yard at Portsmouth and Deep Creek the branch is crossed by three railroad drawbridges and one highway bridge; two drawbridges cross the branch above Deep Creek; the least width of draw opening is 80 feet. There was a depth of not less than 38 feet (11.6 m) in 1934 in the channel from Cape Henry, through Thimble Shoal Channel, Norfolk Harbor, and the Southern Branch of the Elizabeth River, past the navy yard and up to a point 600 yards below the first bridge (Belt Line Railway); thence 33 feet (10.0 m) to the bridge.

Between the first and third bridges the project provides for a channel 375 feet wide and 30 feet (9.1 m) deep; between the third and fourth bridges, 200 feet wide and 25 feet (7.6 m) deep; between the fourth bridge and the entrance to the Albemarle & Chesapeake Canal, 12 feet (3.7 m) deep. In 1934 the controlling depths were 28½, 25, and 11½ feet (8.7, 7.6, and 3.6 m).

The channel for its whole length of 10 miles is marked by ranges, buoys, and beacons, and in daylight is not difficult to navigate as far as the entrance to Deep Creek. Above this to the entrance of the Albemarle & Chesapeake Canal most of the worst bends have been eliminated by dredging straight cuts through the marshes. These cuts are marked in conformity with the intracoastal waterway system.

The Albemarle & Chesapeake Canal is Government owned and is free of tolls. This canal connects the Southern Branch of Elizabeth River with North Landing River. The canal is 7¼ miles long with a controlling depth of 11½ feet (3.5 m) in 1935. It is crossed by four drawbridges, all having draw openings. At the Norfolk Southern Railroad bridge, 1½ miles east of Great Bridge, there is a clearance width of 46 feet, which is the controlling width in the canal. Some of the bridges are opened by hand power and swing slowly. Due consideration should be given this fact by approaching vessels.

There is a tidal lock at the western entrance at Great Bridge, Va. **All boats are required to stop in the lock and furnish certain statistics** relative to the vessel's name, rig, registered number, tonnage, dimensions, draft, valuation, date, and place of construction, port of hail, owner, master, passengers, and freight. The dimensions of the lock are: Width, 75 feet (22.9 m); length, 600 feet (182.9 m); depth over still, 16 feet (4.9 m). The maximum vertical lift is about 3½ feet.

Great Bridge is a small post village on Albermarle & Chesapeake Canal about 700 yards eastward from the west end of the canal. There is a paved highway and telephone and auto-bus connection with Norfolk.

There is a yacht basin on the south side of the canal a short distance eastward of Great Bridge. Supplies, gasoline, Diesel oil, lubricants, and free fresh water and temporary dockage are obtainable. A marine railway capable of hauling vessels up to 90 feet (27.4 m) in length and a tonnage of 50 tons is under construction (December 1934).

North Landing River (charts 3252, 406, and 1227) is 9 miles long in its narraw part from the Albemarle & Chesapeake Canal to **North Landing River Light No. 19,** is 100 to 300 feet (30.5 to 91.4 m) wide and has a least depth of 11.4 feet (3.5 m), which exists between North Landing and North Landing Bridge. The river is well marked by lights and beacons on the east side of the channel.

Southward of **North Landing River Light No. 19** the channel is a dredged cut, 250 feet wide, through the broad part of North Landing River and 90 feet wide through Coinjock Bay and Canal to the head of North River, a total distance of 18½ miles from North Landing River Light No. 19. Bush stakes placed on the east side of the channel between North Landing River Lights Nos. 19 and 41, and on the west side of the channel between North River Lights Nos. 1 and 5, assist in defining the channel. At the south end of

Coinjock Bay spoil banks and stakes indicate the dredged cut. Spar buoys mark the west side of the channel opposite **North Landing River Lights Nos. 33 and 37.**

Tides.—There are no tides in these waters, and the water level depends on the force and direction of the wind. Northerly winds lower the water and southerly winds raise it, there being at times a difference of 2 feet or more below or above the normal, with strong, long-continued winds from one direction.

Munden (charts 3252, 406, and 1227) is a post village and railroad terminal on the east side of North Landing River, eastward of **North Landing River Light No. 23.** From the dredged cut a depth of 7½ feet (2.3 m) can be carried to the ruins of the wharf at Munden.

Currituck is a small village on the west side opposite the mouth of North Landing River. A cut has been dredged across Coinjock Bay to the mainland southeastward of **Bell Island.** It is known as "**Long Point Cut**" and is marked by Long Point Cut Entrance and Long Point Cut Channel Beacons.

Coinjock is a post village on the canal between Coinjock Bay and North River. Gasoline, Diesel oil, and some supplies may be obtained here and storm warnings are displayed. Fresh water is not available in any quantity. There is a lighthouse depot and a good wharf here. A drawbridge crosses the canal at Coinjock. A good highway leads from Coinjock to Norfolk, Elizabeth City, and to Manteo on Roanoke Island.

North River (charts 3252 and 1228) is 4½ miles long in its narrower part from North River Light No. 1 to North River Light No. 19, and thence for 7 miles to the entrance at North River Point the river is wide and nearly straight. The river has a general depth of 9 feet (2.7 m), with a dredged channel 12 feet (3.7 m) least depth over the bar at the entrance. Lights mark the easterly side of the channel of the Intracoastal Waterway which had a controlling depth of 11 feet (3.4 m) in November 1934. The channel is also marked by buoys and a lighted range across the bar at the south entrance to the river. Bush stakes mark the west side of the channel from **North River Light No. 1** to **North River Light No. 5.**

DIRECTIONS, ALBEMARLE & CHESAPEAKE CANAL ROUTE

Local knowledge is required in a few places to carry the best water, but vessels, proceeding with care and exercising extra caution in the few places mentioned, should be able to carry 11 feet (3.4 m) through the Albemarle & Chesapeake Canal with the aid of the charts and these directions. Strangers are advised not to run at night.

The places requiring extra caution are the Southern Branch of Elizabeth River above the mouth of Deep Creek and North Landing River.

Norfolk to head of North Landing River, 18 miles (charts 452, 1227, 3252).—The Southern Branch of Elizabeth River has a length of 6 miles to the mouth of Deep Creek and 10 miles to the entrance of the Albemarle & Chesapeake Canal. There is a tidal guard lock at the western end of the canal at Great Bridge, Va., and vessels are required to stop and furnish certain statistics to the United States engineers.

Entering the Southern Branch between Portsmouth and Berkley,

follow a midriver course until through the first (swing) bridge (Belt Line Railway). When through the draw and up to black spar buoy no. 1, steer about 189° true (S. by W. ¼ W. mag.), passing through the draw of the highway (vertical lift) bridge, and continuing on course to the draw of the third (swing) bridge (Virginian Railway).

When through and above the third bridge, pass southeastward of red spar buoy no. 4 and steer 248° true (WSW. ½ W. mag.) for ⅜ mile, passing midway between the red and black spar buoys. When between buoys nos. 8 and 5, which mark the turn, steer 184° true (S. ⅞ W. mag.) and pass about 150 feet off the wharves of the creosote works on the eastern side at **Money Point.** Then pass red spar buoy no. 10, which marks the turn, and steer 230° true (SW. by W. mag.), heading for St. Julian Light on naval magazine wharf.

Pass about 200 feet off the magazine wharf and haul southward and eastward, leaving the black buoy to northward, and pass about 200 feet off the southern bank. When abreast black spar buoy no. 11, steer 88° true (E. ⅜ S. mag.), heading midway between a red buoy and a small wharf on the northern side. When past the buoy, haul gradually southward for the draw of the fourth (bascule lift) bridge (Norfolk & Western Railway), passing 100 feet eastward of red spar buoy no. 16.

From the draw of the fourth bridge, slightly favor the eastern bank for ¼ mile, then favor the western bank for a distance of ½ mile, and then cross so as to favor the eastern bank when abreast the mouth of Deep Creek. The **Dismal Swamp Canal Route** to Albemarle Sound passes up Deep Creek.

From off the mouth of **Deep Creek** follow the eastern bank, passing eastward of *Deep Creek Junction Buoy* (lighted, red and black horizontally striped buoy off the mouth of the creek) and eastward of the red spar buoy no. 4 above it. Then change course gradually to 188° true (S. by W. ¼ W. mag.), and favor the west bank from the point on that side to the wharf of the burned mill just north of the fifth (swing) bridge (N. & P. B. L. Railway).

Then pass through the draw and follow the west bank from the next point on that side to black spar buoy no. 5 just above it. Then haul over gradually so as to follow the east bank for a short distance above the next point on that side; and then follow the west bank from the point on that side, through the east draw of the sixth (swing) bridge, and to the bend ¼ mile above the bridge.

Passing north of the reflector beacon, go through a short dredged cut-off in midchannel until past red spar buoy no. 8, which lies in the next bend. Then keep in midriver when passing black spar buoy no. 9 in the next bend, and pass south of the reflector beacon and through a short cut-off.

Be guided by the buoys into a dredged cut (the river bends to the northward). After passing through the cut and south of reflector beacon no. 15 cross the river, leave beacon no. 17 to the northward and enter a long cut leading to the canal entrance, course 115° true (SE. by E. ¼ E. mag.).

Albemarle and Chesapeake Canal.—All boats are required to stop and report at the lock at the canal entrance at **Great Bridge.** No directions are necessary for the run through the canal; a good lookout should be kept for logs and snags. Careful steering will be required

going through the railroad drawbridge (Norfolk Southern Railroad) which has a horizontal clearance of 45.9 feet (14.0 m), the minimum horizontal clearance of this route. Three highway bridges, in addition to the railroad bridge at Great Bridge, span the canal. Speed should be reduced on approaching the bridges and signals (three distinct blasts of a whistle, horn, or megaphone) should be given in sufficient time for them to be readily opened.

North Landing River, Currituck Sound, and Coinjock Bay to the head of North River, 28 miles (charts 1227, 406, 3252).—North Landing River from the canal to North Landing River Light No. 19, a distance of 9 miles, is 100 to 300 feet wide and has a least depth of 11.8 feet (3.6 m) at mean low water off North Landing River Light No. 5. It is crooked, but the bends are, as a rule, easy. Several of the worst bends have been eliminated by dredging 12-foot (3.7 m) channels through the marshy points. Vessels should keep in the middle of the river and give the points a good berth in rounding them. Some trouble may be experienced from snags or sunken logs. Two or three branches in the upper part of the river might confuse a stranger, but with the aid of the chart no serious trouble need be had from this cause.

About 1½ miles below the bridge at **North Landing** is the first cut-off. Take the left-hand channel marked by North Landing River Light No. 3 on the east side, passing to eastward of a clump of pines; a wreck visible only at low water lies in the old river channel at the eastern end. There is another short cut marked by North Landing River Light No. 5. Pass to westward of this light. On the west bank at the southern end of this cut is a lone pine tree. The remains of an old wharf in the bend below **West Neck Creek** and south of a stream entering from the west show at all stages of the water level.

About ½ mile below the stream a large bend to the westward has been cut off by dredging. The southern entrance of the cut is marked by North Landing River Light No. 7. In entering the cut take the left-hand channel and pass to westward of the light. In a bight just below the cut-off are a few piles that do not show at high water.

Enter the left-hand passage at the short cut about 0.3 mile above North Landing River Light No. 11. This light marks the north end of another cut-off. Take the left-hand opening and pass west of the light. The cut-offs below here are evident and well marked by lights.

Between **North Landing River Light No. 19** and the head of **North River**, a distance of 18 miles, the channel is a dredged cut, project depth of 12 feet (3.7 m) and 250 feet wide to the entrance to **Coinjock Bay** and 12 feet (3.7 m) deep and 90 feet wide from there to the head of **North River**. The channel is followed easily by means of the lights, which are placed at the turns and along the cut, and the bush stakes which mark the east side of the channel from North Landing River Light No. 19 to Cedar Bay Light No. 41, and the west side from North River Light No. 1 to North Landing River Light No. 53. (Coming from southward, after passing North Landing River Light No. 19, do not confuse a stream leading northwestward with the through route.) In 1935 spoil banks and in some places rows of piling were visible along sections of the cut, on the eastern side between North Landing River Light No. 21 and Cedar

Bay Light No. 41, and on the western side between Cedar Bay Light No. 41 and North Entrance Cut Light No. 43.

All the lights mentioned in the following directions are on the east side of the channel. Pass to westward of these lights. From North Landing River Light No. 19 the course is about 114° true (SE. by E. ⅜ E. mag.) for ½ mile to North Landing River Light No. 21; then 153° true (S. by E. ⅞ E. mag.) for 2⅜ miles, past North Landing River Light No. 23 off the ruined dock at Munden, to North Landing River Light No. 25; then 162° true (S. by E. mag.) for 5 miles, past North Landing River Light No. 27 off Faraby Island and North Landing River Lights Nos. 29 and 31, to North Landing River Light No. 33; then 131° true (SE. ¼ S. mag.) for 2⅜ miles, past Currituck Sound Light No. 35, to Currituck Sound Light No. 37; then 163° true (S. by. E. mag.) for 2⅛ miles, past Bells Island Light No. 39, to Cedar Bay Light No. 41, and then 187° true (S. by W. ⅛ W. mag.) for 1 mile, to North Entrance Cut Light No. 43, which is on the eastern side at the entrance to a short canal, passing to eastward of a red beacon marking the dredged cut across Coinjock Bay. On the west bank of this canal is a stone wall marking the former site of a lighthouse station.

From North Entrance Cut Light No. 43 the course is 171° true (S. ⅜ E. mag.) for 2⅝ miles, past Coinjock Bay No. 45, to Coinjock Cut Light No. 47. From here to North River, Coinjock Canal has a 209° true (SW. ⅞ S. mag.) direction for 2¼ miles. Its southern end is marked by North River Light No. 1. A drawbridge crosses the canal at **Coinjock.**

A canal 22 feet wide, 1 foot (0.3 m) deep at mean low water, and 1.8 miles long connects **Currituck Sound** with the through route. The western end of the canal is about 1.1 miles northward of the drawbridge at Coinjock, and the eastern end empties into **Parkers Creek.**

North River to Albemarle Sound 13½ miles.—From North River Light No. 1 the course is 214° true (SW. ½ S. mag.) for ½ mile to North River Light No. 3; then 172° true (S. ¼ E. mag.) for 1½ miles, in a dredged channel to North River Light No. 5. Then pass to westward of a black spar buoy and round the point to eastward, passing north of a red spar buoy and to the southward of North River Lights Nos. 9 and 11. Favor the north side of the river to North River Light No. 13.

From North River Light No. 13 favor slightly the west shore, pass to eastward of red spar buoy no. 14 which is on range with the point of land to southwest when in midchannel off North River Light No. 13, and give North River Light No. 15 a berth of about 100 yards in making the turn to the westward, then steer about 234° true (SW. by W. ⅜ W. mag.) to pass between North River Light No. 17 and red spar buoy no. 6, off the northwest point of **Buck Island.**

Then keep in midstream around Buck Island, and after passing east of red spar buoy no. 18, head for the point of land to the south-southeastward to a position midway between red spar buoy no. 20 and North River Light No. 19.

Steer about 128° true (SE. ⅛ E. mag.) to North River Light No. 21; then 143° true (SSE. ¾ E. mag.) to North River Light No. 25, passing 100 feet westward of North River Light No. 23.

Then steer 162° true (S. by E. mag.) to pass 100 feet west of North River Light No. 27; then 141° true (SE. by S. mag.) to pass 100 yards west of North River Light No. 29, and southward of the front light of the North River Bar range.

Then bring the two lights (rear light is near ruined wharf at Jarvisburg) in line astern on a 186° true (S. by W. mag.) course and cross the bar into Albemarle Sound, passing to westward of black can buoy no. 33, midway between black can buoy no. 35 and North River Entrance Light No. 34, and to westward of North River Bell Buoy No. 37 and holding the course until up to *North River Entrance Lighted Bell Buoy*. In March 1934 there was a depth of 12 feet (3.7 m) on the range over the bar.

North River to Alligator River.—From *North River Entrance Lighted Bell Buoy* steer 203° true (SSW. ⅝ W. mag.) across Albemarle Sound to a position about 100 yards westward of *Alligator River Lighted Bell Buoy No. 1* at the entrance to the dredged channel to Alligator River, a distance of 10⅜ miles.

The **Intracoastal Waterway** southward passes up Alligator River.

DISMAL SWAMP CANAL ROUTE

(Charts 452, 1227, 1228, 3252)

The **southern branch of Elizabeth River** from Norfolk to Deep Creek is described under the **Albermarle & Chesapeake Canal Route.**

Deep Creek (charts 3252, 452, and 1227), which empties into the Southern Branch about 6 miles above Norfolk, is 2½ miles long to the entrance of the Dismal Swamp Canal. The creek has been improved by dredging a channel, bottom width 80 feet (24.4 m), with a least depth of 10 feet (3.0 m) from the Southern Branch to the canal. The mouth of Deep Creek is marked by *Deep Creek Junction Buoy*, a lighted red and black horizontally striped buoy on the point of a shoal on the east side of the entrance, and *Deep Creek Buoy No. 2* and *Deep Creek Shoal Buoy No. 4* (red spars) on the west side of the channel. Vessels bound to Dismal Swamp Canal should pass northward of the lighted red and black horizontally striped buoy.

Dismal Swamp Canal (chart 1227) is Government owned and maintained and is operated free of toll charges. There are two locks in the canal, the northern one of which is about 8½ miles from Norfolk. The locks have effective lengths of 225 feet (68.6 m), and depths over the sills of 9 feet (2.7 m). The controlling width of the northerly lock is 38 feet (11.6 m) and of the southerly lock is 37 feet (11.3 m). The vertical lift is 12 feet (3.7 m). The canal connects Deep Creek with the Pasquotank River. This canal is 19 miles long, 60 feet wide, with a controlling depth of 9 feet (2.7 m), with turn-outs at distances of about 3 miles where vessels may pass each other. Four drawbridges cross the canal, and all have draw openings wider than the width of the locks.

The settlements on its banks are the post villages of **Deep Creek** at the north entrance, **Wallaceton**, 8 miles from the north entrance, and **South Mills**, about ⅓ mile inside the southern lock of the canal. Gasoline, oil, and some supplies can be obtained at Deep Creek and South Mills. There is a small dock at Deep Creek. The navigation

of Deep Creek and a part of Pasquotank River requires local knowledge to carry the best water. A speed limit of 6 statute miles per hour is enforced.

Lake Drummond Canal connects the Dismal Swamp Canal, at a point about 1⅕ miles southward of Wallaceton, with Lake Drummond to the westward, and acts as a feeder ditch to the Dismal Swamp Canal. Navigation to the lake is restricted by the waste gates in the canal near the lake. There is a small dock and an automobile service station, where gasoline and some supplies can be obtained, on the east side of the Dismal Swamp Canal opposite the entrance to the Lake Drummond Canal.

Turners Cut is a canal 3¾ mile long, 40 to 80 feet (12.2 to 24.4 m) wide, and 10 feet (3.0 m) deep, which extends in nearly a straight line from the Dismal Swamp Canal to Pasquotank River.

Pasquotank River has a length of 11 miles from the southerly end of Turners Cut to Elizabeth City, and thence 15 miles to Wade Point Lighthouse, at the entrance from Albemarle Sound. The upper part of the river has been improved by dredging where necessary and has a controlling depth of 9 feet (2.7 m) to Elizabeth City and 11 feet (3.4 m) from Elizabeth City to Albemarle Sound. Local knowledge is required in places to keep in the best water. Two drawbridges cross the river, one (Norfolk Southern Railroad) about 3 miles above Elizabeth City, and the other, a highway bridge, at the city.

Elizabeth City, population 10,037 in 1930, on the west bank of Pasquotank River 15 miles above Wade Point Lighthouse, is one of the important towns on the inland waters of North Carolina. It has railroad connection and regular communication by steamer with Norfolk and adjacent waters. Anchorage can be had just below the city on the north side of the channel, eastward of a red buoy, in 7 to 12 feet (2.1 to 3.7 m) of water.

The bulkheads, forming the water front, have a sufficient depth alongside, and a vessel can usually find a berth. Provisions, anthracite and bituminous coal, some ship chandlery, gasoline, Diesel oil, and water can be obtained. The river water is suitable for boilers at and above Elizabeth City. The largest marine railway is about 200 feet long, with a capacity of 800 tons, and there are facilities for repairing machinery and the hulls of wooden or steel vessels. Storm warnings are displayed.

Knobbs Creek, a tributary of Pasquotank River, at Elizabeth City, has been dredged and had a depth of 10 feet (3.0 m) from its mouth to the upper (Norfolk Southern R. R.) bridge, February 1933.

New Begun Creek is the only tributary of any importance below Elizabeth City. It empties into the Pasquotank River from the westward 7¾ miles above Wade Point Lighthouse. The controlling depth over the bar and a section of the creek is 5 feet (1.5 m). **Weeksville**, the principal town on the creek, is 3 miles from the mouth.

DIRECTIONS, DISMAL SWAMP CANAL ROUTE

(Charts 452, 1227, 1228, 3252)

Local knowledge is required in a few places to carry the best water, but vessels, proceeding with care and exercising extra caution in the few places mentioned, should be able to carry 9 feet (2.7 m)

through the Dismal Swamp Canal with the aid of these directions. Strangers are advised not to run at night.

The places requiring extra caution are **Deep Creek, Turners Cut,** and in the upper reaches of the **Pasquotank River** where there are numerous sharp bends and the channel is narrow.

Deep Creek, 2½ miles.—Follow the directions for the Southern Branch of Elizabeth River to the mouth of Deep Creek as given for the Albemarle and Chesapeake Canal route, pass about 100 feet northward of *Deep Creek Junction Lighted Buoy* (red and black horizontally striped buoy) and nearly that distance eastward of *Deep Creek Buoy No. 2* and southward of *Deep Creek Shoal Buoy No. 4* in entering the creek. The channel in Deep Creek has been dredged to a depth of 10 feet (3.0 m) with a bottom width of 80 feet and generally has little water on both sides of it. If near low water, the sides of the channel are generally indicated by the swash from the vessel's passage, and otherwise there is nothing to mark it.

For a distance of 300 yards inside the entrance to the first bend the channel favors the north bank, and then for a farther distance of 300 yards until half way to the next bend the channel favors the west bank. The channel then follows the middle of the creek, except in its widest part, ⅝ mile below the canal lock, where it follows the north bank.

Dismal Swamp Canal.—There is a lock at each end of the canal; the lock at South Mills has a width of 37 feet (11.3 m), the controlling horizontal clearance of this route. Passage of vessels having a greater breadth than 36 feet (11.0 m) is not recommended. Vessels are required to stop at the northerly lock and furnish certain statistical information. (See page 74.)

The canal is crossed by 2 highway and 2 railroad drawbridges. The highway bridges, bascule draws, are just beyond and inside the locks at either end. The first railroad bridge is 1.3 and the second 9.3 miles from the northern end. These bridges have bascule draws. The first one is not in use and is left in an open position.

A speed limit of 6 statute miles per hour between locks is enforced. At present, facilities for tying up vessels outside the locks are not good. Small vessels may experience some difficulty when the locks are opened. A hard-surfaced highway parallels the east bank of the canal. Gasoline and provisions may be obtained at towns along the route.

Turners Cut (chart 1227) is 3¾ miles long. The only directions necessary are to keep in the middle. From the lock of the Dismal Swamp Canal it has a southerly direction for ⅜ mile and then a southeasterly direction for 3⅜ miles to Pasquotank River. About ⅝ mile below the lock the river crosses the cut in a north and south direction. At the southerly end of the cut the river joins it from the west-southwestward. The turn into the river is rather sharp and should be approached cautiously. Vessels over 60 feet in length may have difficulty effecting the turn without backing and filling. When northbound, take care to avoid running past the canal entrance.

Pasquotank River from Turners Cut to Elizabeth City, 11 miles.—In the following description the terms "right" and "left" banks are applied as seen when bound southward. Several branches, which enter from the right or western bank of the river, are liable to

confuse a stranger; the rule is to keep to the left passage, bound southward. *On account of numerous sharp bends in the narrow parts of the river and shoal water in the broader parts strangers are advised to proceed with caution in its uncharted part above Elizabeth City.* It is also advisable for vessels of draft near the controlling depth to keep the leads going on both sides, as the slope on either side of the channel is usually sufficient to make the difference in depth obtained with the two leads an indication of where the deeper water lies.

From Turner's Cut to the point on the right bank just below **Coopers Creek** a distance of 4½ miles, the river gradually widens from 100 to 300 feet, and a mid-river course should be followed. At this point the river widens suddenly, and the channel, which is a dredged cut 150 feet wide, with a least depth of about 7 feet (2.1 m) on either side of the channel, favors the left bank, following it at a distance of about 300 feet until around the next point on the left bank about ⅝ mile farther down.

Here the dredged channel leads west of *Shipyard Reach Buoy No. 12*, a red buoy, then between *Shipyard Reach Buoys Nos. 11* and *10*, a black and a red buoy, to a position about 350 feet off **Shipyard Landing** on the east bank. Then change course gradually to 189° true (S. by W. ¼ W. mag.) and pass 100 feet off the point on the right bank just below **Shipyard Landing**, passing eastward of Shipyard *Reach Buoy No. 9.* Continue the course to mid-river, and so continue in the narrower part of the river around the next bend until approaching **Goat Island.**

When 6¼ miles below Turners Cut, pass in midchannel northeastward of **Goat Island**, which is ¼ mile long and has *Shipyard Reach Buoys No. 7* and *No. 5* at its upper and lower ends respectively. Favor the left bank just below the island until abreast the mouth of the creek on the left bank. Then keep in midriver. The Norfolk Southern Railroad bridge crosses the river 9 miles below Turners Cut; the draw is hand moved and has a clear width of 48 feet. In rounding the sharp point 1 mile below the railroad bridge, the bight may be favored slightly just above and below the point to assist in making the turn but keep near midriver off the point itself.

Then keep in midriver; pass about 100 yards off the Elizabeth City Upper Light in rounding the next point on that side, and then favor slightly the right bank until through the lift bridge at Elizabeth City, which is 11 miles below Turners Cut.

Vessels may go alongside the wharves at Elizabeth City, either above or below the bridge; anchorage is usually made around the bend below the bridge.

Pasquotank River from Elizabeth City to Albemarle Sound and Alligator River, 24 miles.—From the highway bridge favor the wharves of Elizabeth City, pass southward of *Marsh Point Buoy No. 6*, then steer 96° true (E. by S. mag.) for **Hospital Point** (on north shore) until in midriver. With the Texaco tanks on the east side of the river at Elizabeth City astern, steer 115° true (SE. by E. ¼ E. mag.). Pass about 100 yards northward of Cobbs Point Light, and continue *on the course* 2⅕ miles past the light to a position ⅗ mile off **Brickhouse Point.** Then steer 135° true (SE. ⅝ S. mag.) for 7⅗ miles

with Anson Point astern, leaving Brickhouse Point Light about ¼ mile on the starboard hand and Miller Point Light about ¼ mile on the port hand, and *Bluff Point Buoy No. 1* about ¼ mile on the port hand, to a position with Poquoson Point Light abeam, distant about ¼ mile.

It is reported by masters of commercial vessels navigating the sounds that, if bound for Alligator River or westward, 9-foot (2.7 m) or less draft can cross the shoal in smooth weather at the entrance to Pasquotank River on a course of 169° true (S. ¾ E. mag.), heading to pass about 100 yards westward of *Alligator River Lighted Bell Buoy No. 1* marking the entrance to the dredged channel to Alligator River, distant 12⅘ miles.

The safer route is as follows.—From a position about ¼ mile southwestward of Poquoson Point Light steer 110° true (SE. by E. ¾ E. mag.) for 4¼ miles, giving the shore a berth of not less than ½ mile, and pass about ½ mile north of Wade Point Light, to a position about 1.4 miles eastward of Wade Point Light. Then steer 187½° true (S. by W. mag.) for about 11 miles across Albemarle Sound to a position about 100 yards westward of *Alligator River Lighted Bell Buoy No. 1* marking the entrance to the dredged channel to Alligator River.

The Intracoastal Waterway southward passes up Alligator River, see page 91.

5. INLAND WATERS OF NORTH CAROLINA

The inland waters of North Carolina are a chain of navigable sounds and their tributary rivers lying inside the line of long, low, and narrow islands which form the seacoast of Virginia and North Carolina. A considerable amount of commercial intracoastwise and pleasure traffic passes through these waterways. Waterborne freight in some quantity moves between the cities on or bordering the sounds and the seaport of Norfolk.

These sounds and the connecting waterways are an important link in the Intracoastal Waterway which is now rapidly assuming greater importance and extends along the Atlantic and Gulf Coasts.

Connection between the inland waters of North Carolina and Chesapeake Bay on the northward is afforded by means of the routes of the Intracoastal Waterway, and to Beaufort Inlet and the southern coastal cities through the Adams Creek Canal, a section of the Intracoastal Waterway, or through Core Sound.

The more important cities are Elizabeth City, on the Pasquotank River, a branch of Albemarle Sound, Edenton on Albemarle Sound, Washington on the Pamlico River, and New Bern on the Neuse River.

ALBEMARLE SOUND

(Chart 1228)

Albemarle Sound is 46 miles long and has a width ranging from 11 miles near its eastern end to 3 miles about 9 miles from its western end. This sound has a good navigable depth for any vessel that can enter through the canals, and with its numerous tributaries forms the approach to a number of towns and landings, from and to which

several steamers, barges, and a number of small sailing vessels are engaged in the carrying trade. There are depths of 10 to 18 feet (3.0 to 5.5 m) along the tracks from North and Pasquotank Rivers to Croatan Sound and less water farther eastward. In heavy weather the passage is uncomfortable and even dangerous for open boats. Fish stakes and nets, extending long distances from the shore, are often found on the shoals, especially at the northern entrance of Croatan Sound. The shores of the sound are low and generally wooded; there are no prominent natural features.

The eastern end of the sound, which is separated from the Atlantic by the narrow beach about 15 miles northward of Bodie Island Lighthouse, is connected northward with **Currituck Sound** and southward with **Croatan** and **Roanoke Sounds**, and by the latter sounds with **Pamlico Sound.** The water in the sound westward of Laurel Point Light is usually fresh or slightly brackish.

The more important towns on the tributaries of Albemarle Sound are **Elizabeth City**, on the Pasquotank River; **Hertford**, on the Perquimans River; **Edenton**, on Edenton Bay; **Winton**, on the Chowan River; **Plymouth** and **Jamesville**, on the Roanoke River; **Columbia**, on the Scuppernong River; and there are also numerous landings. **Supplies** can be obtained at these towns, and there are **marine railways** at Elizabeth City. The rise and fall of the water level depends on the direction of the winds.

A railroad trestle crosses Albemarle Sound about 5 miles from its western end. There is one draw opening for vessels, 1½ miles from the north shore, which is a lift bridge with a clear opening 140 feet (42.7 m) wide and is marked by a bell struck by hand during thick or foggy weather. There are also girder spans about ½ mile apart in the trestle, under which launches without masts can pass. It is reported that the lights on the draw span are low-powered and are difficult to make out in hazy weather.

North River (charts 1228, 3252) is on the north side of Albemarle Sound and extends northward about 12½ miles to the junction with the Coinjock Canal. The river has a general depth of 9 feet (2.7 m). The dredged channel of the **Intracoastal Waterway** (Albemarle and Chesapeake Canal route), which passes down North River, has a controlling depth of 12 feet (3.7 m) and is marked by lights, buoys, and a lighted range across the bar at the south entrance to the river. The river is more particularly described in connection with the waterways from Norfolk to Albemarle Sound.

Pasquotank River is on the north side of Albemarle Sound and is marked at its entrance by Wade Point Lighthouse, which lies 4 miles westward of North River entrance. The deeper entrance is eastward of Wade Point Lighthouse; but with a smooth sea it has been reported that vessels of 9 feet (2.7 m) draft can cross the shoal westward of the lighthouse, on a course of 349° true (N. ⅜ W. mag.), heading for a point about ¼ mile southwestward of Poquoson Point Light. The **Pasquotank River** and **Elizabeth City** are more particularly described in connection with the waterways from Norfolk to Albemarle Sound. (See page 80.)

Flatty Creek, 3 miles westward of Wade Point, is 1 mile wide at its mouth but is shoal and only used by fishermen. There are 2 feet (0.6 m) of water over the bar and 3 to 4 feet (0.9 to 1.2 m) inside.

Little River is on the north side of Albemarle Sound 10 miles westward of Wade Point Lighthouse. The channel is about ¼ mile wide between the shoals at the entrance and is buoyed. The river has a general northwesterly trend to the village of **Nixonton**, which is on the east bank 7 miles above the entrance. Gasoline in limited quantities can be obtained here. About 7½ feet (2.3 m) is the deepest draft that can be taken up to the village. There is a small dock but only very shallow draft boats can lie alongside. Spits, with little water over them and generally steep-to, make out some distance in places from the shores and especially off the points. The channel in the upper reaches of the river is well marked by the ends of the rows of fish stakes which make out from the shore.

Directions.—Pass 100 yards eastward of *Stevenson Point Flats Entrance Buoy No. 1* (black spar) at the entrance, steer 282° true (WNW. ½ W. mag.), and pass close westward of *Mill Point Flats Buoy No. 2*. Then keep near the middle of the river, exercising care to carry the best water between the shoals southwestward of **Long Point**, until abreast the point on the east bank just above **Trueblood Point**, and then favor the eastern bank to Nixonton.

Approaching from westward pass ½ mile southward of Reed Point Light and steer 52° true (NE. by E. mag.) until up with *Stevenson Flats Buoy* (horizontally striped) lying southward of the entrance. Pass 200 yards eastward of this buoy and steer about 344° true (N. by W. mag.) with the black buoy at the entrance on the port bow. Then follow the directions in the preceding paragraph.

Perquimans River is on the north side of Albemarle Sound, its entrance lying 3 miles northwestward of Reeds Point Light. For a distance of 10 miles to the town of **Hertford** the river is from ¾ to 1½ miles wide and has a navigable depth of 9 to 11 feet (2.7 to 3.3 m). The river then becomes narrow and crooked but is navigable for vessels of 8 feet (2.4 m) draft for about 8 miles above **Hertford** to a point near **Goodwins Creek**. Small boats run to **Stony Landing**, about ½ mile below Goodwins Creek. There is an overhead wire crossing about 5 miles above **Hertford**, where the vertical clearance is limited to about 65 feet (19.8 m).

Hertford, population 1,914 in 1930, lies on the south side of the Perquimans River about 10 miles above the mouth. The town ships some lumber by railroad and barges. Gasoline, fresh water, and some supplies can be obtained. There is railroad connection and a paved highway leads to Edenton and Elizabeth City. A highway bridge (swing draw), with horizontal clearances of 52 feet (15.8 m) through the north opening, and 58 feet (17.7 m) through the south opening, crosses the mouth of the narrow part of the river at Hertford. The wharves of the town are above the bridge and are in poor condition. Vessels can lie alongside the bulkhead on the south side of the river immediately above the highway bridge in 10 feet (3.0 m) of water. Fresh water is available here. A towboat can be obtained at Hertford. The Norfolk Southern Railroad crosses the river over a drawbridge 1 mile above town.

Directions.—Pass about ½ mile southwest of Reeds Point Light and steer 303° true (NW. ½ W. mag.) for 4¼ miles to a position 700 yards northeast of Harvey Point Flats Beacon (reflector). Or, if approaching from westward, pass ¼ mile south and east of *Perqui-*

mans Bluff Flats Buoy (horizontal striped buoy) lying south of Harvey Point and steer 352° true (N. ¼ W. mag.) for 1½ miles to a position 700 yards northeast of Harvey Point Flats Beacon. With **Grassy Point** a litle on the port bow, steer 299° true (NW. by W. mag.) for 2½ miles to a position 150 yards northeast from *Blount Point Spit Buoy No. 3.* Then steer 285° true (WNW. ⅛ W. mag.) for 1¾ miles to a point 200 yards southwest of Grassy Point Light.

If bound to anchorage off **Ferry Point**, steer 311° true (NW. ¼ N. mag.) for about 5¼ miles, with Ferry Point a little on the starboard bow. On this heading Ferry Point shows as a wooded head on the northeast side of the river. Anchor 300 yards southwest of Ferry Point in about 9 feet (2.7 m) of water. There is no room for anchorage in the river above this point.

If bound up river or to Hertford, local knowledge is required to carry the best water. It should not be attempted by strangers. The entrance to the narrow part of the river at Hertford is through a dredged channel 200 feet wide and 9 feet (2.7 m) deep, which has a 301° true (NW. ¾ W. mag.) direction, the middle of the channel lying 200 yards from the point on the west side below the bridge. In December 1934 four white mooring buoys maintained by the Major and Loomis Lumber Co. marked the east spoil bank of the cut. When on the line of the face of the bulkhead below the bridge, the course should be changed for the draw. Go through either side of the draw. *There are submerged stumps on both sides of the dredged channel.* Hertford Shoal Beacon (black slatted daymark on pile) marks the edge of shoal on the west side.

Yeopim River is 5½ miles westward of Perquimans River. It is shoal and unimportant. There are 4 feet (1.2 m) of water over the bar between **Batts Island** and **Drummond Point.** Some logging is done along the south shore.

Edenton Bay is a small bay on the northern side near the western end of Albemarle Sound, about 2 miles westward of the railroad trestle which crosses the sound. The entrance and channel are marked by buoys and range lights. The Edenton Harbor channel had a controlling depth of 10 feet (3.0 m) according to an examination made in February 1933. The large water tank just westward of the rear range light is the most prominent object seen from the sound. A brick chimney near the front range and a water tank on the east side of the bay are also prominent.

Edenton is a town at the head of the bay about 1½ miles above the entrance; it has railroad communication with Norfolk and the South, and small steamers trade to points in the sound and its tributaries. Some lumber is shipped by railroad and in barges. A towboat is stationed here. Supplies, ice, gasoline, coal, and water can be obtained. The river water is fresh and suitable for boilers. The wharf on which the front light is located is the city wharf and has 12 feet (3.7 m) of water alongside. Vessels can go to the wharves just westward of the range and also to the old railroad wharf at the northwest end of the harbor. The railroad wharf now in use is at the northeast end of the harbor and is reached through a channel about 100 feet wide.

The inner anchorage, which is small and has a depth of 9 feet (2.7 m), is close eastward of the range line and about 250 yards

southward of *Johnson Creek Buoy No. 6*. The larger anchorage is on the west side of the range line and about midway between *Edenton Bay Lighted Bell Buoy No. 2* and *Johnson Point Shoal Buoy No. 4*.

A vehicle ferry runs from Edenton to Mackay Creek across the sound.

Pembroke Creek enters from the westward into Edenton Harbor. A fish commission hatchery is located about ½ mile from its mouth, to which 5 feet (1.5 m) can be carried. The creek is navigable for 3 miles to Wildcat Bridge. There is a small marine railway at the fish hatchery capable of handling vessels up to 10 tons.

Directions.—From the lift draw in the trestle crossing Albemarle Sound steer 333° true (NNW. mag.) for nearly 3 miles, with *Edenton Bay Lighted Bell Buoy No. 2* at the entrance of Edenton Bay on the starboard bow. When the Edenton Harbor range lights, which show just eastward of a prominent water tank, and between the tank and a large sheet-metal warehouse, are in line, bearing 14° true (N. by E. ¾ E. mag.), steer for them and be guided by the range and buoys until up to the wharves. At night these range lights are difficult to make out on account of confusion caused by automobile lights in town. The range is hard to see in hazy weather.

Chowan River empties into the western end of Albemarle Sound from northward and with its tributaries is one of the largest rivers in North Carolina. For a distance of 17 miles above its mouth the river has an average width of about 1½ miles. In this part of the river large areas of tree stumps, many of which are under water, are generally found on the shoals; **Stumpy Reach** is the name applied to the worst place between **Colerain Landing** and the mouth of **Bennetts Creek**, a distance of 6 miles, where stumps occur on shoals with depths of about 12 feet (3.6 m) or less. Above this the river is much narrower but has a good channel with a depth of 9 feet (2.7 m) for 50 miles above its mouth. Regular water transportation is maintained between Edenton, Winton, and Tunis at the Atlantic Coast Line crossing 2½ miles below Winton. The controlling depth in Chowan River is 11 feet (3.4 m) near **Bull Pond Point**.

A highway bridge has been built across the river about 2 miles above the mouth. The draw span is about in the middle of the river and has a horizontal clearance of 80 feet; the vertical clearance at high water, when the highway bridge is closed, is reported to be 7 feet (2.1 m).

Colerain Landing is on the west bank 12 miles above the entrance. The village of Colerain is on the hill ½ mile inland. There is a depth of 10 feet (3.0 m) at the oil wharf and 10 feet (3.0 m) at the large T-shaped wharf used by river boats. Supplies and gasoline can be obtained at Colerain.

Tunis is a landing on the south bank east of the Atlantic Coast Line Railroad crossing, about 35 miles above the mouth of the river. A row of broken piling and stakes extends out into the river from the ruined dock just south of the railroad dock. In coming into the railroad dock at Tunis, head for the draw of the railroad bridge until the dock is almost abeam, then steer for the dock. There is a

depth of from 6 to 9 feet (1.8 to 2.7 m) along the east side and from 6 to 9 feet (1.8 to 2.7 m) alongside the northeast face.

The railroad drawbridge is a swing type, hand moved, with a horizontal clearance of 53 feet (16.2 m). If passing further upstream, after passing through the railroad draw, steer 300° true (NW. ⅝ W. mag.) to avoid the broken piling about 200 yards northwestward of the bridge. Then continue in midchannel.

Winton is a small town on the west bank of the river about 37 miles above the mouth. Gasoline and some supplies can be secured in the town. No water is available at the docks. There are three wharves at Winton with depths from 7 to 11 feet (2.1 to 3.4 m) alongside.

Meherrin River joins the Chowan from westward about 2½ miles above Winton. The river is navigable for vessels of about 7 feet (2.1 m) draft for a distance of 10½ miles to the village of **Murfreesboro**. It has been reported that there was a controlling depth of 10 feet (3.0 m) in February 1935. Small boats run as far as Princeton Landing, 4½ miles above Murfreesboro. The width of the river is 100 to 350 feet. There are five small pile wharves on this river. There are no railroad connections with any of them, but ordinary county roads extend to them.

The junction of the Blackwater and Nottoway Rivers is about 13 miles above Winton. **Blackwater River** had a controlling depth of 7 feet (2.1 m) May 1932 for a distance of 11 miles to the bridge at the town of **Franklin**. There is a wharf and a warehouse there and wharves between Franklin and the mouth of the river. A Seaboard Air Line Railway track is laid down on the wharf at Franklin, and at the other wharves are ordinary country roads. Small boats are able to reach Burdett, Va., 10½ miles above Franklin. The width of the river is 100 to 250 feet.

Nottoway River is navigable for vessels of 8-foot (2.4 m) draft when the river is not low for a distance of 10 miles to Munroe Ferry. There is a drawbridge at Munroe Ferry; horizontal clearance 30 feet (9.1 m). A draft of 4 to 5 feet (1.2 to 1.5 m) can be taken up to the bridge at any time of the year. A fixed highway bridge about 3½ miles above the entrance of Nottoway River has a vertical clearance of 15 feet (4.6 m) at mean high water. The head of navigation for vessels is at the closed bridge of the Seaboard Air Line Railway, 5 miles above Munroe Ferry. The railroad bridge has a vertical clearance of 12.3 feet (3.7 m) at mean high water. Above this bridge navigation is limited by bars, snags, and closed bridges to flatboats and rafts of 2-foot (0.6 m) or less draft.

Caution.—Owing to the large areas covered with tree stumps, which are 4 to 5 feet (1.2 to 1.5 m) under water, it is advisable for a stranger to take a pilot at Edenton or at the mouth of the river.

Salmon Creek is a small stream emptying into Chowan River close to Albemarle Sound. **Avoca**, a post office, is 1 mile from its mouth. A boat line runs to Edenton. The entrance of the creek is a good harbor for small boats of 6-foot (1.8 m) or less draft.

Roanoke River (charts 1228, 409) empties into the southwestern end of Albemarle Sound. The shallow bight at the mouth of the river is known as "Bachelors Bay", and near its eastern part, off the mouth of the river, is Roanoke River Lighthouse. There are

stumps on the shoals at the mouth of the river. Roanoke River from the confluence of **Staunton** and **Dan Rivers** is 170 miles long to its mouth and is the approach to a number of small towns and villages to which steamboats run. The river is navigable eight months of the year for vessels of 8-foot (2.4 m) draft to **Palmyra**. A depth of 6 feet (1.8 m) at low water can be taken up to **Hamilton** all the year and 3 feet (0.9 m) to a point 2 miles below **Weldon**, the head of navigation. In January 1935 there was a depth of 10 feet (3.0 m) in the channel across the bar at the entrance to the river.

The principal landings on the river and their approximate distances above its mouth are **Plymouth**, 6 miles; **Jamesville**, 15½ miles; **Williamston**, 31 miles; **Hamilton**, 54 miles; **Palmyra**, 72 miles; **Edwards Ferry**, 90 miles; **Halifax**, 102 miles; and **Weldon**, 112 miles.

The river is subject to frequent and sudden freshets, which overflow large areas of the lowland on both of its banks. Sailing vessels seldom go above Plymouth unless they are towed, the upper part of the river, on account of its width and crooked course, being navigated by steamers. It is advisable for a stranger to take a pilot at Edenton. The river is crossed by a new highway bridge at Williamston. There is a draw span in this bridge. Near Palmyra, the Atlantic Coast Line Railroad crosses the river.

Plymouth is an important town, population 2,139 in 1930, near the mouth of the Roanoke River. It has good highway and railroad connections. Fresh water, gasoline, Diesel oil, ice, and supplies in any quantity can be obtained here. The best wharf is that of the railroad at the upper end of the town. There are three small municipally owned docks at the foot of Adams, Washington, and Jefferson Streets, respectively. There is a small marine railway capable of hauling a vessel of 30 feet in length. Some veneer and lumber is shipped.

Williamston, population 2,731 in 1930, is 31 miles above the mouth of the river. The docks are grouped above and below the highway bridge about 0.8 mile below the town. The town dock, about ¼ mile above the bridge, has a depth of 9 feet (2.7 m), at normal water, alongside. Gasoline, Diesel oil, and supplies can be obtained in the town. There is no fresh water at the docks. Lumber and tobacco are shipped from Williamston.

Cashie River, which also flows into Batchelor Bay, is reported navigable for a draft of about 9 feet (2.7 m) to **Windsor**, about 25 miles above its mouth, the controlling depth being found on the entrance bar. About 7 miles above its mouth it is connected with the Roanoke River by a passage known as the "**Thoroughfare**." There is considerable traffic on this river. The head of navigation is at **Windsor**, where a fixed highway bridge crosses the Cashie River. Gasoline and some supplies can be secured at Windsor. There is a depth of 9 feet (2.7 m) at the docks below the bridge.

Directions.—After passing through the draw of the trestle across the sound, steer 242° true (WSW. mag.) to a position in midchannel northward of Roanoke River Entrance Light. From this point vessels approaching the limit of draft are advised to take a pilot. They may be obtained at Edenton.

The dredged channel into the Roanoke River had a controlling depth of 10 feet (3.0 m) in January 1935. The channel is well

marked by buoys. Stumps are visible in the north edge of the channel near the western end. Beyond Roanoke River Light No. 1 follow midstream.

Vessels desiring to enter the **Cashie River** follow the Roanoke River to the passage known as the "**Thoroughfare**", 3.7 miles above Plymouth, and then into the Cashie. Caution should be exercised in the Thoroughfare, as there are numerous sharp bends. There are two small islands at the junction of the Thoroughfare and the Cashie River. Pass in midchannel to the eastward of the islands. From here midchannel is followed to the town of Windsor.

Mackay Creek is on the south side of Albemarle Sound just westward of the railroad trestle which crosses the sound. A channel 140 feet wide and 9 feet (2.7 m) deep was dredged through the bar at the entrance, but it has narrowed and shoaled. In March 1933 there was a controlling depth of 8 feet (2.4 m). It is marked on each side by rows of piles and by a light on the eastern side of its entrance. There are stumps in places on the shoals at the mouth of the creek. **Mackays** is a post village ½ mile above the entrance. A vehicle ferry runs from Mackays to Edenton. A railroad bridge (width of draw, 35 feet) crosses the creek just inside the entrance, and a highway bridge (width of draw, 31 feet) crosses at Mackays. The creek is navigable for vessels to a closed bridge 8 miles by water or 3½ miles by land above Mackays; to this bridge the creek is 180 to 90 feet wide and 20 to 12 feet (6.1 to 3.6 m) deep. Above this bridge to a dam at the post office of **Roper**, a distance of 2½ miles by water or ½ mile by land, the creek is 90 to 30 feet wide and 12 to 3 feet (3.6 to 0.9 m) deep.

Bull Bay is the western part of the bight in the south shore of Albemarle Sound southeastward of Laurel Point Lighthouse. A buoyed channel leads through the shoals which obstruct the entrance, but a stranger should sound out the channel before attempting it. Several small creeks empty into the western side of the bay, none of which is navigable for boats. A channel, with a depth of 8 feet (2.4 m) when the water is high, leads through flats to the entrances of these creeks.

Scuppernong River empties into the eastern end of Bull Bay from southeastward. In July 1935 there was a controlling depth of 10 feet (3.0 m) on the bar at the mouth of the river, thence 10 feet (3.0 m) to **Columbia**, thence 7 feet (2.1 m) to **Spruills Bridge**, and thence 6 feet (1.8 m) to **Cherry Bridge**.

Columbia, population 864 in 1930, is a village 4½ miles above the mouth of the river. The controlling depth to Columbia is 9 feet (2.7 m). There is communication by railroad and steamer, and some supplies, anthracite coal, and gasoline can be obtained. The best dock is about 100 yards below the highway bridge, is privately owned, and has a depth of 9 feet (2.7 m) at its face. The other docks between and above the bridges at the town have similar depths at their faces.

Four drawbridges cross the river between Columbia and Cherry, the two at Columbia having clear openings 39 feet wide, and those above, 30 feet. A closed bridge 6 feet (1.8 m) above low water crosses at Cherry. A channel 150 feet wide and 10 feet (3.0 m) deep

leads through the bar at the entrance from Bull Bay. This channel is marked by buoys and range lights. The buoy at the entrance of the channel lies 4⅜ miles 134° true (SE. ¼ S. mag.) from Laurel Point Lighthouse.

Directions.—Having come up onto the entrance range, pass westward of Scuppernong River Entrance Light and steer 132° true (SE. ½ S. mag.) through the dredged cut, passing east of Mill Point Light. Continue on course to black spar buoy no. 1 marking the eastern end of the cut, then steer 112° true (SE. by E. ⅝ E. mag.) for 1½ miles. Pass the point on the southern bank in mid-channel and head for black spar no. 3 marking the northwest end of the dredged channel between two shoals.

After passing through this channel and rounding black spar buoys no. 5 and no. 7, stand in mid-channel south of the point on the northern shore to black spar buoy no. 9. The red spar buoy no. 2 to the southeastward marks a shoal and should be given a berth to the northward of about 100 yards. Then favor the north bank, round the next point in mid-channel, and then favor the east bank to the draw of the highway bridge, at Columbia. Keep a good lookout for net stakes.

Alligator River (charts 1228, 3252) is on the south side of Albemarle Sound, 11 miles westward of Croatan Lighthouse. This river, with the Alligator River-Pungo River Canal and Pungo River, comprises that section of the **Intracoastal Waterway** which lies between Albemarle Sound and Pamlico Sound. Vessels using this route avoid the difficult channel in Croatan Sound and most of the open waters of Pamlico Sound.

The entrance is full of shoals through which there is a channel with a depth of 11 feet (3.4 m), marked by *Alligator River Lighted Bell Buoy No. 1* in Albemarle Sound.

For a distance of about 18 miles above its mouth the river has a south direction, is 2 to 3 miles wide, and has general depths of 8 to 11 feet (2.4 to 3.4 m). Above this the river has a length of about 24 miles, is narrow and crooked, and has a depth of 6 feet (1.8 m), or more, nearly to its head, its upper part, however, being too narrow to turn in. Logs are towed from the river in barges and rafts.

On the eastern side just inside the mouth of the river is the entrance to **East Lake** and **South Lake**, which have general depths of 6 to 8 feet (1.8 to 2.4 m). **East Lake Post Office** is a small settlement 3¼ miles southward of Alligator River entrance. There is regular ferry service to **Fort Landing** on **Little Alligator River**. There is connection with Manteo on Roanoke Island by highway and a ferry which crosses Croatan Sound.

Little Alligator River empties into Alligator River from westward just inside the entrance. This river has a narrow, crooked channel with a depth of 6½ feet 2.0 m). This channel is marked by brush stakes on its westward side. A draft of 5 feet (1.5 m) can be taken about 4 miles above Fort Landing.

Fort Landing is a post village on the west bank of Little Alligator River about 2 miles above the mouth. Gasoline and some supplies can be obtained here. A ferry runs to **East Lake P. O.** on the east side of Alligator River.

There is an excellent small-boat anchorage off Fort Landing in a depth of 6 feet (1.8 m); a draft of 4 feet (1.2 m) can be taken to the ferry dock.

To enter Little Alligator River, leave the dredged channel in Alligator River at a point about ¾ of a mile northward of Alligator River Light No. 8 and head for the point on the south side of Little Alligator River entrance. Give this point a berth of about 200 yards and slightly favor the south bank until midway between **Great Island** and the small island off the second point on the south side of the river, being guided by the brush stakes which mark the western edge of the channel. Then head for the clearing in the western skyline marking the road to the ferry dock at **Fort Landing.** There is good anchorage for vessels of over 6 feet (1.8 m) draft in about 10 feet (3.0 m) of water in the mouth of Little Alligator River, about ¾ of a mile westward of the **Intracoastal Waterway.**

Whipping Creek empties into Alligator River from the east side about 15½ miles south of Alligator River Light. From Whipping Creek there is a boat passage 14 miles long to **Long Shoal River.**

Directions, Alligator River.—Having come up to a position about 100 yards westward of *Alligator River Lighted Bell Buoy No. 1*, steer 198° true (SSW. ⅛ W. mag.), following the dredged channel as indicated by lights and buoys for 7¾ miles to Alligator River Light No. 12. Then steer 175° true (S. mag.) for 9 miles to Alligator River Light No. 25, being guided by the lights and buoys. Then follow the cut to the entrance of the **Alligator River-Pungo River Canal,** being guided by the lights and buoys marking the channel, and giving **Deep Point** a berth of about 100 yards. The entrance to the canal is marked by Alligator River Light No. 42, a red triangular daymark with yellow border on a white wooden tower on the west side of the entrance. There are some stakes left from former dredging operations near and on the south side of the entrance.

Alligator River-Pungo River Canal (charts 1228, 1231, 3252).—This land cut, 18¼ miles in length, to Wilkerson Creek, forms the **Intracoastal Waterway** connection between the Alligator and Pungo Rivers. The waterway is well marked by lights and buoys. In March 1934 the controlling depth was 12 feet (3.7 m). Snags are a potential source of danger in the canal.

Two drawbridges cross the canal. There is a highway bridge across Wilkerson Creek 1 mile above its mouth and a railroad bridge across the land cut 0.8 mile north of here. The railroad bridge is no longer in use and remains open. A highway ferry is operated by the United States Engineers at a point 11 miles north of the railroad bridge. The ferry should be approached cautiously and a warning whistle blown to insure the ferry cable being let down.

DIRECTIONS, ALBEMARLE SOUND

The sound is compartively free from dangers to vessels of the draft that navigate it. There are shoals making from the shore and the points along the shore of the sound. These can generally be avoided by giving the shore, and especially the points, a berth of at least 1 mile. From March to May, inclusive, the shoals in the sound

are full of fish stakes and nets, especially along the north shore, where it is difficult to avoid them.

Directions for entering the sound by the Intracoastal Waterway through the canals and North and Pasquotank Rivers are given on pages 79 and 82.

Having come from northward through North River

1. **If bound to Croatan Sound.**—*When across the bar and up to North River Entrance Lighted Bell Buoy*, steer 161° true (S. by E. ¼ E. mag.) for 6½ miles, then 144° true (SSE. ¾ E. mag.) for 5 miles. This course should lead to a position about 200 yards east of *Caroon Point Buoy No. 2* (red nun) off **Caroon Point** with **Croatan Lighthouse** nearly ahead. Then pass about 125 yards westward of Croatan Lighthouse. Fish stakes are numerous in this vicinity. Then follow the directions on page 95.

2. **If bound to Alligator River.**—From a position about 100 yards east of *North River Entrance Lighted Bell Buoy* steer 204° true (SSW. ⅝ W. mag.) for a distance of 10⅜ miles across Albemarle Sound to a position about 100 yards westward of *Alligator River Lighted Bell Buoy No. 1* at the entrance to the dredged channel to Alligator River.

3. **If bound to Bull Bay or Scuppernong River**, make good a 246° true (WSW. ¼ W. mag.) course for 23 miles from *North River Entrance Lighted Bell Buoy*. Then, if bound into the bay, steer 220° true (SW. mag.) for the entrance buoy, or, if bound into Scuppernong River, 180° true (S. ½ W. mag.) until the entrance range is on. Then follow the directions on page 91.

4. **If bound to Edenton Bay or Mackay Creek or into Chowan River.**—From *North River Entrance Lighted Bell Buoy* a 254° true (W. by S. mag.) course made good for 29 miles will lead 2½ miles southward of Wade Point Lighthouse, 1 mile southward of Reeds Point Light, ¾ mile northward of Laurel Point Lighthouse, and ¾ mile southward of *Bluff Point Shoal Buoy No. 4* (red nun) off **Bluff Point**. After passing this buoy bring Laurel Point Lighthouse astern on a 265° true (W. mag.) course, which made good for 6½ miles will lead to the lift draw in the trestle crossing the sound. This draw is a conspicuous object for many miles. Then be guided by the directions under the proper headings on pages 87 and 89.

Having come from the Northward through Pasquotank River

1. **If bound to Croatan Sound.**—From a position about ½ mile northward of Wade Point Lighthouse steer 143° true (SSE. ¾ E. mag.) for 15¾ miles to a position about 200 yards east of *Caroon Point Buoy No. 2* (red nun) off **Caroon Point** with **Croatan Lighthouse** a very little on the starboard bow. Then pass about 125 yards westward of Croatan Lighthouse. Fish stakes are numerous in this vicinity. Then follow the directions on page 95.

2. **If bound to Alligator River.**—From a position about 2¼ miles eastward of Wade Point Light steer 186° true (S. by W. mag.) for a distance of 11 miles across Albemarle Sound to a position about 100 yards westward of *Alligator River Lighted Bell Buoy No. 1* at the entrance to the dredged channel to Alligator River.

3. **If bound to Bull Bay or Scuppernong River,** bring Wade Point Lighthouse to bear 0° true (N. ½ E. mag.), distant ½ mile, and steer to make good a 239° true (SW. by W. ¾ W. mag.) course for 19¾ miles. Then, if bound into the bay, steer 220° true (SW. mag.) for the entrance buoy, or, if bound into Scuppernong River, 180° true (S. ½ W. mag.) until the entrance range is on. Then follow the directions on page 91.

4. **If bound to Edenton or Mackay Creek, or into Chowan River,** bring Wade Point Lighthouse to bear 0° true (N. ½ E. mag.), distant ½ mile, and steer 245° true (WSW. ¼ W. mag.) for 12¾ miles to a position 1 mile southward of Reed Point Light. Then steer 254° true (W. by S. mag.) for 12½ miles, passing ¾ mile southward of *Bluff Point Shoal Buoy No. 4* (red nun) off Bluff Point. After passing this buoy, bring Laurel Point Lighthouse astern on a 265° true (W. mag.) course, which made good for 6½ miles will lead to the lift draw in the trestle crossing the sound. This draw is a conspicuous object for many miles. Then be guided by the directions under the proper heading on pages 87 and 89.

CURRITUCK SOUND

(Charts 1227, 1229)

Currituck Sound is a narrow and shoal body of water extending from Albemarle Sound in a north-northwesterly direction for 25 miles and is separated from the ocean by a narrow strip of sand beach. The lower part of the sound is navigable for boats of 4 to 5 feet (1.2 to 1.5 m) draft for a distance of 11 miles above the entrance from Albemarle Sound, but the navigation is difficult on account of extensive shoals. A highway bridge with a draw span crosses the entrance of the sound near Sampson Point.

Back Bay (chart 1227) and its connection with Currituck Sound extends a little over 10 miles northward from the northeastern end of the sound. The bay is shoal and navigable only for small boats. Northward of Back Bay is a shallow body of water known as **North Bay.**

North Landing River (charts 406, 1227, 3252) extends in a north-northwesterly direction from Currituck Sound and forms a link in the **Albemarle and Chesapeake Canal Route** of the **Intracoastal Waterway.** The river has a width of from 100 to 300 feet (30.5 to 91.4 m) in its narrow part, which extends for a distance of 9 miles from the Albemarle and Chesapeake Canal. There is a least depth of 11.4 feet (3.5 m) in the channel between North Landing and North Landing Bridge. Spoil banks and rows of piling lie on the east side of the channel in the wider section of the river. Depths range up to 7 feet (2.1 m) in the unimproved sections.

CROATAN SOUND

(Chart 1229)

Croatan Sound, west of Roanoke Island, connects **Albemarle** and **Pamlico Sounds,** and is used by vessels bound through these sounds. A dredged channel, well marked by buoys and lights, with a controlling depth of 10 feet (3.0 m) in August 1932, leads through Croatan

Sound. Strangers should not attempt to pass through Croatan Sound at night. Fish stakes are numerous in season, especially at the northern and southern ends of the sound.

There is a good harbor in **Peter Mashoes Creek**, west-northwesterly of **Croatan Lighthouse**, but entrance is only possible for small boats. There is a fish house on piling on the north side of the entrance to which a draft of 7 feet (2.1 m) can be taken on approaching from the north-northeastward.

There is a small dock at **Manns Harbor**, westward of Blockade Shoal Light. Manns Harbor Canal Light stands in 4 feet (1.2 m) of water about 200 yards east of the dock. It is reported that a draft of 5 feet (1.5 m) can be carried to the dock by heading westward from the deeper waters of the sound to a position about 100 yards off the ruined dock southward of the ferry dock, and then hauling northward to that dock. Gasoline may be obtained at Manns Harbor. There is regular ferry service between **Manns Harbor** and **Roanoke Island**.

Roanoke Marshes is the name applied to the point and fishing station westward of **Roanoke Marshes Lighthouse**. A crooked slough, from 50 to 100 yards wide, leads in a north-and-south direction across the point, and the fishing station with a number of small wharves is on this slough. A small vessel can enter either end of the slough and make fast to the steep banks or at the wharves, with good shelter. The least depth at either entrance is 7 feet (2.1 m), and the depth in the slough varies from 12 to 16 feet (3.7 to 4.9 m). Both entrances are sometimes nearly blocked by fish stakes, but there is a narrow, clear passage. The north entrance is westward of the islet lying northward of the island on which the huts are located. A mid-channel course should be followed in the slough, and care is required when passing the opening between the islet and the island.

Wanchese is a post village near the south end of Roanoke Island and has a landing near the mouth of **Oyster Creek**, 2¾ miles northeastward of Roanoke Marshes Lighthouse. There are stores; fresh water and gasoline are obtainable. There is telephone communication from the dock.

To enter, bring Oyster Creek Light on range with Bodie Island Lighthouse (high tower on the outside beach) and pass 200 yards southward of the beacon. Vessels of 6-foot (1.8 m) or more draft should keep southward of this range to avoid a 6-foot (1.8 m) spot. There is 7 feet (2.1 m) off the end of the dock. There is good anchorage for small craft. There is daily freight boat service to Manns Harbor, Peter Mashoes Creek and Elizabeth City.

Height of water in Croatan Sound depends entirely on the winds, which may under exceptional conditions lower or raise the level as much as 1½ feet from the normal; easterly winds lower the water and westerly winds raise it. Strong northerly or southerly winds produce currents, which are especially marked when the wind shifts suddenly to the opposite point.

Directions, Croatan Sound.—From a position about 125 yards westward of **Croatan Lighthouse** pass eastward of red *Channel Buoy No. 4* just south of the lighthouse and then steer 135° true (SE. ½ S. mag.) for 4¼ miles to a position westward of black *Channel Buoy No. 11* about ¼ mile south-southeastward of Blockade Shoal Light, passing

westward of a number of black spar buoys and the light. This course is through a dredged channel 10 feet (3.0 m) deep. Then steer 168° true (S. ½ E. mag.) for 5¼ miles through a dredged channel marked on its eastern edge by black spar buoys to a position 50 to 100 yards eastward of Roanoke Marshes Lighthouse.

ROANOKE SOUND

(Chart 1229)

Roanoke Sound lies between Roanoke Island and a sand beach, Bodie Island, which separates it from the ocean. A depth of 6 feet (1.8 m) can be carried from Albemarle Sound, through the northern part of Roanoke Sound, and through a dredged channel, 100 feet wide, into **Shallowbag Bay** to the wharves of the village of **Manteo.**

There is a narrow channel, through which a draft of 4 feet (1.2 m) can be carried close to the eastern side of Roanoke Island from Shallowbag Bay to Pamlico Sound. It is marked only at its southern end by a red nun buoy but is used considerably by local boats. The best water lies 150 yards off the island from Shallowbag Bay to the mouth of Broad Creek and about ⅜ mile off from the south side of Broad Creek to the south end of the island. **Shallowbag Bay** is a good anchorage for small craft of less than 6-foot (1.8 m) draft.

A causeway crossing Roanoke Sound connects Manteo and Roanoke Island settlements with Bodie Island and settlements on the outside beach. There is a draw span in the causeway where it crosses the channel of Roanoke Sound.

Manteo, population 547 in 1930, is the largest village on **Roanoke Island.** There is communication by steamer with Elizabeth City and by power boats with the neighboring villages. A ferry operates from the west side of Roanoke Island, near Manteo, across Croatan Sound to Manns Harbor. There is a depth of 6 feet (1.8 m) alongside the docks at Manteo. Gasoline, Diesel oil, and some supplies are available; there is a good hotel. There are facilities for hauling out vessels of 20 tons weight and 4-foot (1.2 m) draft.

Nags Head is a summer resort on the east side of Roanoke Sound, eastward of the north end of Roanoke Island. A good paved highway extends northward from the causeway along the beach for about 10 miles, then crosses the lower end of Currituck Sound by a causeway with a draw span to Point Sampson, from whence there is a good highway to Norfolk.

Directions to Manteo from Albemarle Sound.—To enter Roanoke Sound from northward, pass close northward of Collington Island Shoal Light and steer 100° true (ESE. ⅝ E. mag.), keeping Nags Head Light ahead and Collington Island Shoal Light astern for 5 miles, giving Roanoke Island a berth of over ½ mile.

Then pass northward and close eastward of Nags Head Light and steer about 162° true (S. by E. ⅛ E. mag.) for 1½ miles to pass 50 feet eastward of Baum Point Light.

Then steer 220° true (SW. ⅛ W. mag.) for ¾ mile to Manteo Light, red slatted pile structure. When south of this light, steer 270° true (W. ½ N. mag.) for ¼ mile and then northwestward to the wharves.

Brush stakes mark the western edge of the channel. Strangers of 4-foot (1.2 m) or less draft should have no trouble in entering. Anchorage can be had southeastward of the wharf at a distance not greater than ¼ mile; also in the bay between the wharf and **Ballast Point**. A channel 100 feet wide has been dredged along the wharves.

Height of water in Roanoke Sound depends entirely on the winds, which may, under exceptional conditions, lower or raise the level as much as 1½ feet from the normal; easterly winds lower the water and westerly winds raise it. Strong northerly or southerly winds produce currents, which are especially marked when the wind shifts suddenly to the opposite point.

PAMLICO SOUND

(Charts 1229, 1231, 1232, 537, 538)

Pamlico Sound is the largest body of water in North Carolina and is separated from the Atlantic Ocean by a narrow beach extending from Bodie Island Lighthouse to Cape Hatteras, a distance of about 35 miles, and thence in a west-southwesterly direction for about 35 miles. From Croatan Sound to the mouth of Neuse River the distance through the middle of Pamlico Sound is about 65 miles; the greatest width of the sound is about 24 miles. **Oregon, Hatteras,** and **Ocracoke Inlets** pierce the narrow beach, giving access to the ocean, but all are blocked by inside bars with little depth over them. They are described in another part of this volume.

The northern and western shores of the sound are irregular, being broken by numerous small bays and by two large rivers, **Pamlico River** and **Neuse River**. The general depth of water in the middle of the sound is between 18 and 24 feet (5.5 and 7.3 m), but shoals in many places extend miles from the shore; northward of Ocracoke Inlet, **Bluff Shoal**, with 7 to 12 feet (2.1 to 3.7 m) over it, extends completely across the sound.

Strong winds from any direction raise in the exposed parts of the sound a short, choppy sea, uncomfortable to small craft and even dangerous to open boats; but protected anchorage for small craft may be found in the many bays along the northern shore and along the southern shore in several sloughs which lead to sheltered berths in the lee of shoals. **Middleton Anchorage** and the anchorage in the bight formed by the hook of Royal Shoal can be made either day or night and are used.

Tides, except at the inlets, where there is a rise and fall of about 2 feet (0.6 m), are due entirely to winds and are small, except under the influence of strong winds. Easterly and westerly winds produce the greatest change in water level, which rarely exceeds 2 feet (0.6 m). There are no noticeable currents except in the vicinity of the inlets.

Long Shoal River is a good anchorage for vessels of 8-foot (2.4 m) or less draft. The entrance, which is about 1½ miles wide, lies on the north shore of Pamlico Sound, 7½ miles westward of Long Shoal Lighthouse. Shoals with 1 to 2 feet (0.3 to 0.6 m) over them lie on either side of the entrance and break the sea from southward. The channel has a depth of 9 feet (2.7 m) to an anchorage above

Pains Bay Shoal Buoy No. 2, a depth of about 7 feet (2.1 m) for 1½ miles, and 5 feet (1.5 m) for a distance of 3 miles above *Pains Bay Shoal Buoy No. 2*. The eastern point of **Pingleton Shoal** is marked by *Pingleton Shoal Light*, and the points of the shoals in the entrance are marked by buoys, and a stranger with the aid of a chart should have no difficulty in entering during the daytime. The end of **Long Shoal** is marked by *Long Shoal Bell Buoy No. 2*.

Directions, Long Shoal River.—*From eastward* give Long Shoal Lighthouse a berth of 2¼ miles when southeastward of it and outside of *Long Shoal Bell Buoy No. 2*, and when it bears 321° true (NW. by W. mag.), steer 282° true (WNW. ½ W. mag.) for 9 miles; or vessels of 7-foot (2.1 m) or less draft, with a smooth sea, can cross Long Shoal about ⅜ mile northwestward of the lighthouse and from a position ¾ mile westward of the lighthouse steer 272° true (W. ⅝ N. mag.) for 7 miles with the lighthouse a little on the starboard quarter. Either course will lead to a position ⅜ mile southward of *Pains Bay Shoal Buoy No. 2* on the eastern side of the entrance.

Then steer 344° true (N. by W. mag.) and pass 200 yards westward of *Pains Bay Shoal Buoy No. 2* and the same distance eastward of *Pingleton Shoal Buoy No. 3*. The course continued will lead in the best water until above the shoal which makes off from the eastern shore northward of Pains Bay, and then keep near mid-river. Anchor on the sailing line, the depths shoaling from 11 feet (3.4 m) north and east of Pingleton Shoal Light, to 9 feet (2.7 m) abreast *Pains Bay Shoal Buoy No. 2* and to about 8½ feet (2.6 m) abreast *Pingleton Shoal Buoy No. 3*. Vessels of greater draft than 7 feet (2.1 m) should not go above *Pingleton Shoal Buoy No. 3*. There is also good anchorage, exposed only to southeasterly winds, southward of *Pains Bay Shoal Buoy No. 2* and eastward of **Pingleton Shoal.**

From westward pass ¾ mile southeastward of Gull Shoal Light and outside of *Gull Shoal Bell Buoy No. 2* and steer 25° true (NNE. ⅝ E. mag.) for 11¾ miles. Pass about ⅜ mile southeastward and eastward of Pingleton Shoal Light marking the southerly end of Pingleton Shoal and steer about 330° true (NNW. ¼ W. mag.) for 1⅜ miles to a position 200 yards westward of *Pains Bay Shoal Buoy No. 2*. Then steer 344° true (N. by W. mag.) as in the preceding paragraph.

Cape Channel, leading from Pamlico Sound through the shoals westward of the outer beach separating the sound from the ocean, leads to the town of Buxton, 2 miles northward of Cape Hatteras. The channel is used a great deal by local fishermen. **Buxton** and **Frisco** are small towns near Cape Hatteras. There are no wharves, and anything but a light-draft boat has to anchor well offshore. The channel for a distance of 3 miles from the entrance light has a depth of 8 feet (2.4 m) or more.

Directions, Cape Channel.—From a position 2⅜ miles eastward of Long Shoal Light make good a 180° true (S. ½ W. mag.) course for 13¾ miles to a black and white vertically striped can buoy (*Entrance Buoy*), or from Bluff Shoal Light a 70° true (ENE. ¾ E. mag.) course for 21½ miles will lead to the same buoy. Then steer 133° true (SE. ⅜ S. mag.) for 2¼ miles to a position 100 feet southward of North Point Light (black slatted pile structure), passing a black

and white vertically striped nun buoy (*Middle Buoy*). Round the light and steer 35° true (NE. ⅜ N. mag.), passing a black can and a red nun buoy, to a position 75 feet northward of Muddy Slue Light (red slatted structure). Then steer 98° true (ESE. ¾ E. mag.) and be guided by the buoys. The best anchorage is just eastward of *Mid-Channel Buoy* (black and white vertically striped can), but there is a smaller anchorage inshore of the *Anchorage Buoy* (black and white vertically striped nun) near the ice house.

Far Creek, between **Gibbs Shoal** and **Pingleton Shoal**, leads to **Englehard**, where gasoline may be obtained. In January 1936 there was a depth of 7 feet (2.1 m) in the dredged channel from Pamlico Sound to the landing at Englehard. Far Creek Entrance Light marks the entrance to the channel; Far Creek Channel Light marks an angle in the channel about ¾ mile from the village.

Middleton Anchorage is a broad, open bight in the northern shore of Pamlico Sound, about 6 miles northward of Gull Shoal Lighthouse. The anchorage has depths of 9 to 13 feet (2.7 to 4.0 m) and is sheltered from eastward by **Gibbs Shoal**, which has from 1 to 4 feet (0.3 to 1.2 m) over it. There is no shelter from southeasterly or southerly winds. The anchorage is large and easy of access and is used to some extent by tows and other vessels. **Middleton** is situated a short distance inland from the anchorage and is reached by light-draft boats by going up **Middle Creek**. Vessels must pass south of Gibbs Shoal Light on the southeast end of **Gibbs Shoal** in entering.

Directions—Middleton Anchorage.—*From northeastward.*—From a position 2⅜ miles southeastward of Long Shoal Light steer 250° true (WSW. ⅝ W. mag.) for 13 miles; or vessels of 7 feet (2.1 m) draft, with a smooth sea, can cross Long Shoal about ⅜ mile northwestward of the light and steer 238° true (SW. by W. ⅝ W. mag.) for 12 miles. Either course will lead to a position ½ mile southeastward of Gibbs Shoal Light on the southeasterly end of Gibbs Shoal. Then steer about 265° true (W. mag.) for 1 mile, and then steer 310° true (NW. mag.). Anchor about ¾ to 1 mile from shore in a depth of 11 to 12 feet (3.4 to 3.7 m). On all sides of the anchorage the shoals rise abruptly from the depths of 9 to 11 feet (2.7 to 3.4 m).

From westward.—Passing about ¾ mile eastward of Gull Shoal Light and outside of *Gull Shoal Bell Buoy No. 2*, a 350° true (N. ½ W. mag.) course will lead to the anchorage.

At night.—Pass well southward of Gibbs Shoal and bring Gull Shoal Light astern on a 354° true (N. ⅛ W. mag.) course, which will lead to the anchorage. The low, marshy shore, which extends long distances in front of the woods in places, does not generally show at night.

Small vessels of less than 5 feet (1.5 m) draft in rough weather prefer to pass inside of Gull Shoal Light if bound southwestward from Middleton anchorage, by entering Wysocking Bay (see p. 100), then passing westward of Gull Rocks, between them and Hog Island Point, where there are 5 feet (1.5 m) of water. The southern end of this inside passage is marked by Hog Island Shoal Light, located about ½ mile eastward of Hog Island.

Wyesocking Bay makes into the north shore of Pamlico Sound northwestward of Gull Shoal Light. It is a convenient anchorage for small craft of 6-foot (1.8 m) or less draft when following the north shore of the sound. The entrance is obstructed by shoals, through which a buoyed channel leads into the bay northward of Gull Shoal. **Gull Rock**, which just shows above water, is a part of the shoals on the south side of the bay.

Long Point Shoal Buoy No. 2 (red nun) at the entrance lies 1¾ miles 319° true (NW. ¾ N. mag.) of Gull Shoal Lighthouse. Wyesocking Bay Light marks the point of shoal on the south side of the entrance to the bay and lies about 2½ miles northwest-by-west from Gull Shoal Light. Anchorage in 10 to 11 feet (3.0 to 3.4 m) can be had ½ to 1 mile northwestward of *Long Point Shoal Buoy No. 2* on the west side of a shoal, with about 4 feet (1.2 m) over it, which extends from the buoy to the shore.

A canal dug to 6 feet (1.8 m) leads from **Old Bay**, an arm of Wyesocking Bay, to **Nebraska**, a village 2 miles inland, where gasoline and supplies may be obtained. The entrance to this canal is marked by Douglas Bay Light, but local knowledge is required to carry the best water in between the spoil banks. A branch from this canal leads to **Lake Landing**, but in 1927 this branch was obstructed by shoaling.

Directions.—To enter the bay, pass about 200 yards south of *Long Point Shoal Buoy No. 2* and steer 270° true (W. ½ N. mag.) for about 1¼ miles to a position midway between Wyesocking Bay Light and *Long Point Inner Shoal Buoy No. 4*. Then steer 310° true (NW. mag.), with the light at the entrance to the canal dead ahead. Anchor in 7 to 8 feet (2.1 to 2.4 m), ⅜ to ½ mile off the west side of **Long Point**, with its southerly end bearing eastward of 108° true (ESE. mag.). Above this anchorage the head of the bay has depths of 3 to 5 feet (0.9 to 1.5 m).

Mattamuskeet Lake.—A canal, with its entrance between Bluff Point and Hog Island, leads to Lake Mattamuskeet. It is not navigable on account of a bar which has formed across the mouth and a fixed highway bridge at **New Holland**.

Bluff Point, low and marshy, separates **East Bluff** and **West Bluff Bays**, two unimportant bights southwestward from Wyesocking Bay. Bluff Point Shoal Light marks the end of the shoal making eastward from Bluff Point. Extending southward from Bluff Point is a large area of shoal water, a tongue of which, called **Bluff Shoal**, extends across Pamlico Sound. The soundings on it are from 7 to 12 feet (2.1 to 3.6 m), and the best crossing is marked by **Bluff Shoal Light** (tower on piles). A 12-foot (3.7 m) slue through the shoal lies 1 mile northward of Bluff Shoal Lighthouse. Its southern edge is marked by *Bluff Shoal Slue Buoy No. 1* (black can). A shoal with 4 feet (1.2 m) of water over it lies 2 miles south-southeastward of Bluff Point. It is marked by *Bluff Point Lump Buoy No. 2* (red nun). The west end of the 5-foot (1.5 m) shoal, about ½ mile southwestward from Bluff Point, is marked by *Cunning Shoal Buoy No. 2* (red nun).

Juniper Bay makes into the north shore of Pamlico Sound 1½ miles eastward of Great Island. The entrance is about 1½ miles wide, but toward its head the bay narrows gradually, and 3 miles

above the entrance it is a narrow, crooked stream. Shoals make off from both shores, but the middle of the bay has a depth of 7 to 10 feet (2.1 to 3.0 m).

The west side of the entrance to Juniper Bay is marked by *Juniper Bay Shoal Buoy No. 1* (black spar), which also marks the east entrance to Swan Quarter Narrows. There is considerable traffic to the farms on the bay in small craft of 5-foot (1.5 m) or less draft, which use the inside route through Swan Quarter Narrows and Bay, and the canal to Deep Bay, in making the passage to and from Belhaven.

Swan Quarter Bay makes into the north shore of Pamlico Sound westward of Great Island. At its entrance the bay is about 2 miles wide, but it contracts gradually toward its head, which is distant about 4½ miles above the entrance. A depth of 8 to 11 feet (2.4 to 3.4 m) can be taken up to abreast the town of **Swan Quarter** through the channel, which is marked by range lights and buoys. The bay is full of oyster beds.

Great Island is low and grassy and has a few houses at its northern end. **Swan Quarter Narrows** (known locally as Great Island Narrows), the channel northward of the island, is good for vessels of 6-foot (1.8 m) draft. Swan Quarter Narrows Light also marks the west entrance to Swan Quarter Narrows. There is a prominent skeleton steel observation tower on the north side of the narrows.

A canal 50 feet wide and 6 feet (1.8 m) deep connects Swan Quarter Bay with Deep Bay. From Deep Bay the canal trends 49° true (NE. ¾ E. mag.) through the land to Swan Quarter Canal Light, passing close to and southward of it, and then trends 80° true (E. ½ N. mag.) for Swan Quarter range rear light to the channel of Swan Quarter Bay.

Swan Quarter, population 223 in 1930, is the county seat of Hyde County. It is the center of trade for much of this area. It is connected with interior points in the State by a hard-surface highway, via Belhaven and Washington. Gasoline and some supplies can be obtained at Swan Quarter. The depth at the docks is 7 feet (2.1 m).

A canal 30 feet wide and 7 feet (2.1 m) deep has been dredged ½ mile in an east-northeast direction from Swan Quarter Bay to Swan Quarter. The canal entrance is on the eastern side of the bay 1⅛ miles above Swan Quarter range rear light and is marked by Swan Quarter Bay Light (red structure); dredged material shows on the shore northward of the canal entrance. Access to the town is made easy by this canal, which has a recess at its inner end so that turning in the narrow channel can be avoided.

Directions, Swan Quarter Bay.—Local vessels up to 6-foot (1.8 m) draft use the canal to Deep Bay (see below) in making the passage to or from points on **Pamlico River** and **Belhaven**, and use Swan Quarter (Great Island) Narrows when coming from or bound eastward. Strangers in vessels of deeper draft should enter by the deeper channels which lead between the extensive shoals southward of the bay. The following are directions from eastward:

Passing on either side of Bluff Shoal Lighthouse at a distance of about ¼ mile, bring it astern on a 296° true (NW. by W. ¼ W. mag.) course for about 12 miles, passing 1 mile southwestward of Great Island Light (red and black pile structure).

Pass 1 mile southwestward and westward of Great Island and steer 336° true (N. by W. ¾ W. mag.) on the line of the Swan Quarter range lights, passing close to *Swan Quarter Island Shoal Buoy* (perpendicularly striped) in the entrance. Pass 200 yards eastward of the front light, steer 326° true (NNW. ½ W. mag.), and pass about 200 yards south-southwestward and 150 yards westward and northwestward of the rear light.

Then steer 35° true (NE. ½ N. mag.) for about ½ mile, heading for the church steeple in **Swan Quarter**, and then follow the curve of the channel northward and pass about 100 yards eastward of *Judith Marsh Shoal Buoy No. 3* (black spar).

Anchorage in a depth of 11 feet (3.4) can be had about ¼ mile eastward or northeastward of the front light; above the front light, anchorage can be selected in the channel, which is good for a depth of 8 feet (2.4 m) to *Judith Marsh Shoal Buoy No. 3* (black spar).

Rose Bay makes into the north shore of Pamlico Sound at the entrance of Pamlico River. The entrance is about 1¾ miles wide, but shoals making off from both sides leave the channel about ⅝ mile wide. The depth in the channel is 9 feet (2.7 m) or more for a distance of 4 miles above the entrance; the principal shoals are marked by lights or buoys for this distance, above which the channel is narrow, crooked, and is good for a depth of 6 feet (1.8 m). *Judith Narrows Buoy No. 1* (black spar) marks the end of the shoal on the west side of the entrance to both **Judith Narrows** and **Deep Cove**, just east of the entrance to Rose Bay. Rose Bay, Deep Bay, and the canal to Swan Quarter Bay form an inside route that is generally used by local vessels up to 6-foot (1.8 m) draft. The canal is described with Swan Quarter Bay.

Directions.—Approaching from southward, bring Pamlico Point Lighthouse astern on a 3° true (N. ⅝ E. mag.) course; approaching from westward, give the shore a berth of ½ mile, and pass southward of the fish stakes on the shoals westward of the entrance. Pass ¼ miles westward and 250 yards northwestward of Judith Island Light, steer 55° true (NE. by E. ¼ E. mag.), and leave *Marsh Point Shoal Buoy No. 1* (black spar) about 50 yards on the port hand. When past this buoy, steer 27° true (NNE. ¾ E. mag.) and be guided by the buoys; anchor southward of *Long Point Shoal Buoy No. 3* (black spar).

To Deep Bay.—From *Marsh Point Shoal Buoy No. 1* steer 75° true (E. by N. mag.) for 1 mile, and then steer 122° true (SE. ¾ E. mag.) for 1¼ miles to a position 250 yards southward of Upper Island Point Light. A 93° true (E. ⅝ S. mag.) course will then lead to the entrance of the canal which leads to Swan Quarter Bay. Judith Marsh Light is to be left to starboard in entering the canal.

Mouse Harbor, Big Porpoise Bay, and **Middle Bay** are small, shallow bays on the western side of Pamlico Sound between Pamlico Point, at the entrance of Pamlico River, and Jones Bay. There are no aids to assist a stranger. They are frequented only by the boats of local fishermen.

Jones Bay makes into the western shore of Pamlico Sound just northward of the entrances of Bay and Neuse Rivers. The bay is navigable for vessels of 7-foot (2.1 m) draft for a distance of 5 miles above its mouth. The entrance is somewhat obstructed by

shoals, through which a buoyed channel leads into the bay. On the north side, near the head of the bay, is the post village **Hobucken**, the small-craft landings for which are in the cove ¾ mile above **Drum Creek**. When the water is high, small boats can be taken through the old canal from **Ditch Creek** to **Bay River**.

The **Intracoastal Waterway** crosses the upper end of Jones Bay and forms a connecting waterway to Goose Creek and Bay River.

Directions.—*From eastward.*—With a smooth sea a depth of 6 feet (1.8 m) can be taken across Brant Island Shoal by passing about 250 yards southward of Brant Island Slue Light on a southwesterly course. From a position ½ mile southwestward of this light steer 280° true (WNW. ¾ W. mag.) for 6 miles and pass about 200 yards southward of *Entrance Buoy No. 2* and *Middle Buoy No. 4*. Or, from a position ¼ mile southwestward of Brant Island Shoal Lighthouse make good a 289° true (WNW. mag.) course for 10¾ miles and pass ⅜ mile southward of *Entrance Buoy No. 2* and 200 yards southward of *Middle Buoy No. 4*.

Round *Middle Buoy No. 4* at a distance of 200 yards, steer 33° true (NE. ¾ N. mag.), and pass 200 yards southward and eastward of *Inner Buoy No. 1*. Anchor ¼ to ½ mile northwestward of *Inner Buoy No. 1*, above which there are no aids. About 1 mile above *Inner Buoy No. 1* a spit extends nearly halfway across the bay from the point on the southwest side of the entrance, and otherwise the channel is near the middle.

From westward.—Avoid the shoal, which extends over 1 mile southeastward from Bay Point; **Bay Point Light** is on its southerly end, and the shoal extends a short distance eastward and nearly ¾ mile northeastward from the light. A 317° true (NW. ½ N. mag.) course, heading for the westerly point at the entrance of Jones Bay, will lead eastward of this shoal and up to *Middle Buoy No. 4*.

Cedar Island Bay is a large, irregularly shaped body of water making into the western shore of Pamlico Sound southward of Neuse River entrance. The shores of the bay and its numerous branches are marshy, and it is of no importance except for its oyster beds. A depth of 9 feet (2.7 m) can be taken into the principal arms of the bay through narrow and crooked channels. **Cedar Island Bay Light** marks the northwest side of the channel at the entrance of the bay and is located in a depth of 6 feet (1.8 m) on the end of the shoal which extends south-southeastward from Swan Islands. The ends of the shoals in the bay are marked by lights and buoys.

From the south branch of Cedar Island Bay, the branch next eastward of Long Bay, the **Thorofare**, a canal dredged to 4½ feet (1.4 m) deep and 60 feet wide, forms a connection to **Thorofare Bay** and thence into **Core Sound**. The canal is used by local fishermen. Local knowledge is necessary for its navigation, as the canal entrances have shoaled and the channel is narrow. There is a 2-foot (0.6 m) shoal in midcanal about ¼ mile westward of the cable ferry. The channel passes north of this shoal. The channel into the north entrance to the **Thorofare** is marked by Thorofare West Beacon and Thorofare West Light. Pass west and close to the beacon and light.

Royal Shoal is the name given to the hook-shaped shoal extending northwest from **Ocracoke Inlet**. Southwest Point Royal Shoal Light and *Royal Shoal Anchorage Buoy No. 1* (black can) mark the

point of the hook, and an old abandoned lighthouse marks the northwest extremity of the shoal. In the bight formed by the hook of Royal Shoal vessels and tows sometimes anchor when the sea is too rough to make headway in the sound. The shoal, which has from 2 to 4 feet (0.6 to 1.2 m) over it and is bare in one place, breaks the sea so as to leave comparatively smooth water at the anchorage. The depth is 9 to 14 feet (2.7 to 4.3 m), and the holding ground good.

Directions, Royal Shoal Anchorage.—From the vicinity of Bluff Shoal Lighthouse pass ½ mile northward and westward of Northwest Point Royal Shoal unused lighthouse and then steer about 198° true (SSW. mag.).

When Southwest Point Royal Shoal Light bears 130° true (SE. mag.), steer 142° true (SE by S. mag.) and give the lighthouse a berth of about ¾ mile in rounding it until it bears westward of north, passing southward of the black can buoy.

Pass ½ mile eastward of the lighthouse on a north-northeasterly course; anchorage can be selected from ¾ to 1½ miles eastward or northeastward of the lighthouse in a depth of 10 to 14 feet (3.0 to 4.3 m).

DIRECTIONS, PAMLICO SOUND

Roanoke Marshes Light to Adams Creek (Charts 1229, 1231, 1232).—Bring Roanoke Marshes Light astern on a 177° true (S. ¼ W. mag.) course, passing eastward of *Roanoke Marshes Buoy* (horizontally striped spar) and well westward of *Obstruction Buoy* (horizontally striped spar), to a position about 200 yards eastward of *Croatan Sound Channel Entrance Buoy No. 6*, 1¾ miles south of the light.

Then steer 167° true (S. ⅝ E. mag.) for 5¼ miles, giving the shore a berth of about 1½ miles, until **Stumpy Point** bears 254° true (W. by S. mag.). From this position steer 178° true (S. ¼ W. mag.) for 10 miles until Long Shoal Light bears 310° true (NW. mag.), distant 2⅜ miles. *Long Shoal Bell Buoy No. 2* marks the extremity of **Long Shoal**, and is, at this position, distant ¼ mile and on range with the light.

Then make good a 227° true (SW. ⅝ W. mag.) course for 27¼ miles to a position 100 yards off *Bluff Shoal Slue Buoy No. 1* marking the southern edge of the 12-foot slue through **Bluff Shoal**.

With the buoy and Bluff Shoal Light on range and bearing 170° true (S. ⅜ E. mag.) and the light distant 1 mile, change course and steer 241° true (SW. by W. ⅞ W. mag.) for 12 miles to a position ½ mile south of Brant Island Shoal Light.

From Brant Island Shoal Light make good a 259½° true (W. ⅝ S. mag.) course for 10½ miles to a position 1 mile west of Point of Marsh Light. On this course Neuse River Light (white skeleton tower on piles) should be picked up ahead with Point of Marsh Light a little on the port.

Then make good a 238° true (SW. by W. ⅝ W. mag.) course for 9½ miles, passing 1 mile south of Neuse River Lighthouse, ¼ mile southward of *Gum Thicket Shoal Buoy 2A* marking **Gum Thicket Shoal**, and to a position ¼ mile westward of *Garbacon Shoal Lighted Buoy 1A*.

From a position ¼ mile westward of *Garbacon Shoal Lighted Buoy 1A* steer 212° true (SW. ¾ S. mag.) for 2¾ miles, heading for

the point on the south side of the river westward of **Adams Creek**, passing westward of *Adams Creek Bell Buoy*. When Adams Creek Light No. 2 bears 132° true (SE. ¼ S. mag.), distant 1 mile, steer this course and pass 50 yards eastward of the light.

Vessels of 6-foot (1.8 m) or less draft can follow the northwest shore of Pamlico Sound more closely, as follows:

Bring Roanoke Marshes Light astern on a 177° true (S. ¼ W. mag.) course, giving the shore a berth of about 1 mile, until 7½ miles from the light and **Stumpy Point** bears 265° true (W. mag.). Then steer 184° true (S. ⅞ W. mag.) for 7 miles, heading for Long Shoal Light.

Cross **Long Shoal** about ⅜ mile northwestward of the light and steer 225° true (SW. ½ W. mag.) for 17⅜ miles to a position ½ mile southward of Gull Shoal Light, passing about midway between the light and *Gull Shoal Bell Buoy No. 2*, off the end of the shoal. Anchorage may be had in **Wyesocking Bay** or **Middleton anchorage** in case of rough weather. (See p. 99.)

Then steer 239° true (SW. by W. ⅝ W. mag.) for 15¼ miles, passing southward of two red buoys and to the horizontally striped buoy at the southeast end of **Lower Middle.**

Then steer 249° true (WSW. ½ W. mag.) for 8 miles, heading for Brant Island Shue Light. Pass about 250 yards southward of this light and steer 232° true (SW. by W. mag.) for 8 miles to a position westward of Point of Marsh Light, then follow the directions preceding.

PAMLICO RIVER

(Charts 1231, 537)

empties into the northwestern part of Pamlico Sound from northwestward. The town of **Washington**, on the east bank, 31 miles above the entrance, is considered the head of navigation for sailing vessels. A depth of 10½ feet (3.2 m) existed in January 1936 in the channel to the town of Washington. The limiting depth at the town is about 10½ feet (3.1 m). The channel to Washington is marked by lights and buoys.

Tar River, which is the continuation of **Pamlico River** above Washington, has a controlling depth of 3½ feet (1.1 m) to a point 2 miles below **Greenville**, thence 1 foot (0.3 m) to the mouth of **Fishing Creek**. The principal cities on the river above Washington are **Greenville**, 19 miles, and **Tarboro**, 43 miles. The river is clear of snags to **Little Falls**, 77 miles. The head of navigation is **Dunbar Bridge**, 94 miles above Washington. Somewhat greater depths obtain for a period of four to six months during the winter season. **Fishing Creek** is a branch of Tar River, 49 miles above Washington; is obstructed by a snag 2 miles above its mouth and above it is in bad condition.

The tributaries to Pamlico River are described below. The most important are Pungo River, Goose Creek, South Creek, Bath Creek, and Durham Creek.

Washington, population 7,035 in 1930, the county seat of Beaufort County, is an important busines center and a port of entry, and has communications extending to practically all points on Pamlico River and Pamlico Sound. It has excellent highway and rail connections and hotel accommodations. There is regular freight-boat service to

Norfolk, Edenton, Winton, New Bern, and Wilmington. The town ships lumber and tobacco and distributes supplies to the villages and settlements on the shores of Pamlico Sound. Bituminous coal, gasoline, Diesel oil, water, and ice can be obtained. There is a small marine railway capable of handling boats up to 50 feet in length, and minor repairs can be made. There is a relief station of the Public Health Service, and storm warnings are displayed. The water in the river above Core Point is usually fresh enough to use in the boilers of steamers.

Pungo River empties into Pamlico River from northward about 4 miles above the entrance. The channel is well marked by buoys and lights and can be readily followed by a stranger for a distance of 15 miles. It then becomes narrow but has a least channel depth of about 8 feet (2.4 m) to **Leechville**, a village 18½ miles above its mouth; a drawbridge crosses the river at Leechville. A number of navigable creeks empty into Pungo River, from which logs are towed to Belhaven. The most important are Pungo Creek, Wilkerson Creek, and Slade Creek. The **Intracoastal Waterway** follows the course of Pungo River from the **Alligator River-Pungo River Canal** to the **Pamlico River.**

Slade Creek empties into Pungo River from eastward 4 miles above Wade Point. A depth of 7 feet (2.1 m) can be taken 2 miles above the entrance and 4 feet (1.2 m) 1½ miles farther.

Pungo Creek empties into Pungo River from westward 1¼ miles southwestward of Belhaven. A drawbridge crosses the narrow part of the creek 2¼ miles above the entrance. A depth of 7 feet (2.1 m) can be taken just above the bridge and 6 feet (1.8 m) about 2 miles farther.

Pantego Creek empties into Pungo River from northward 8½ miles above Wade Point. A drawbridge crosses just above Belhaven.

Belhaven, population 2,458 in 1930, a post office and railroad terminus, is on the eastern side of **Pantego Creek** where it empties into the **Pungo River.** The town, which has an excellent harbor for small craft, is of considerable importance, and ships oysters by rail and lumber in barges. There is weekly freight-boat connection with Norfolk and Albemarle and Pamlico Sound ports. Gasoline, Diesel oil, water, provisions, ice, and some coal can be secured at Belhaven.

There are marine railway facilities for small boats, and lifting equipment of 25 tons capacity; draft to the railway is limited, however, to 5 feet (1.5 m).

A channel 12 feet (3.7 m) deep, well marked by buoys and a light, is available from Pungo River to Belhaven, and a draft of 7 feet (2.1 m) can be taken 2¼ miles above the entrance to Pantego Creek. The drawbridge which crosses just above Belhaven is moved by hand and has a horizontal clearance of 40 feet.

The dredged channel off the wharves has a depth of 12 feet (3.7 m). The city dock can accommodate a draft of 10 feet (3.0 m) along its face and the oil dock immediately to the northwestward can accommodate a draft of 9 feet (2.7 m). There are depths of 12 feet (3.7 m) at the outer end of the railroad dock and 10 feet (3.0 m) at the outer end of the cooperage company wharf.

Wilkerson Creek is the western end of the **Alligator River-Pungo River Canal**, and empties into Pungo River about 2½ miles below **Leechville**.

Goose Creek empties into Pamlico River from southward about 6½ miles above its entrance. The dredged channel of the **Intracoastal Waterway**, well marked by buoys and lights, crosses the shoals which obstruct the mouth of the creek and passes southward through **Goose Creek** and **Upper Spring Creek** to the canal which forms the connection to **Bay River**. The entrance is marked by Goose Creek Light No. 1, which stands in 7 feet (2.1 m) on the southeast side of the channel. The controlling depth in this section of the waterway is 12 feet (3.7 m). **Campbell Creek, Upper** and **Lower Spring Creek, Eastham Creek, Snode Creek,** and **Dixon Creek** are navigable tributaries of Goose Creek. Logs are towed from the creek.

South Creek empties into Pamlico River from southward about 9 miles above its entrance. The deeper entrance leads southward of Indian Island and the shoal connecting the island with Hickory Point and is buoyed. **Indian Island Slue** is a dredged cut, good for vessels of 5-foot (1.5 m) draft, across the shoal between Indian Island and Hickory Point. The course through the cut is 178° true (S. ⅛ W. mag.), passing close to the two buoys which mark it, and about 100 yards eastward of Indian Island Slue Light. South Creek has a least channel depth of 8 feet (2.4 m) for a distance of 4 miles above Hickory Point.

Aurora, a village on the railroad 6½ miles above Hickory Point, is reached through a dredged channel 100 feet wide with a controlling depth of 7 feet (2.1 m) in 1936. Gasoline and some supplies are available. There is a depth of 9 feet (2.7 m) at the docks. The dredged channel follows the line of deepest water as shown on the chart, but local knowledge is needed to carry the best water above **Point of Marsh**. A drawbridge with a clear width of 20¼ feet crosses the river just above Aurora, and a railroad bridge, which is practically the head of navigation, crosses at Royal, 1¼ miles above Aurora.

Bond Creek is on the south side of South Creek southward of Hickory Point. It has a depth of 7 feet (2.1 m) to the small fish wharf at the post office of **South Creek**. To enter, pas northward and ¼ mile westward of buoy no. 1; then steer 207° true (SSW. ¾ W. mag.) for the entrance and be guided by the buoys to the wharf.

North Creek empties into Pamlico River from northward about 12 miles above Pamlico Point Lighthouse. Its buoyed channel is good for a depth of 7 feet (2.1 m). Some lumber is shipped out.

Durham Creek empties into Pamlico River from southward about 17½ miles above its mouth and 2½ miles westward of Rumley Marsh Light. The creek is navigable for a draft of 5 feet (1.5 m) nearly to **Bonners Bridge**, a distance of 4 miles above its mouth. A sawmill and wharf, with 6 feet (1.8 m) at its end, are located on the west side ½ mile above the entrance. There are no aids except an entrance light, which marks the west side of the narrowest part of the channel at the entrance.

Bath Creek empties into Pamlico River from northward, 3½ miles northwestward of Rumley Marsh Light. A draft of 6½ feet (1.9 m) can be taken to the village of **Bath**, about 1¾ miles above its mouth, and a draft of 5 feet (1.5 m) can be taken about 4 miles above the entrance. A drawbridge, horizontal clearance of 40 feet (12.2 m), crosses the creek at the upper end of Bath. The most difficult place in the channel to Bath is in the narrowest part of the entrance, where a shoal which shows by the grass on it extends halfway across from the west side and rises abruptly from the channel. The eastern end of this shoal is marked by a lighted beacon. There is a depth of 9 feet (2.7 m) at the dock below the bridge, and small boats can lie in 6½ feet (2.0 m) alongside the bulkhead above the bridge. Gasoline and some supplies are available at Bath.

Bayview is a modern pleasure resort on the north bank of Pamlico River, about 1 mile below Bath Creek and about 20 miles by highway from Washington. There is a hotel, and good communications are maintained with interior cities. The nearest railway is at Washington. Gasoline and some supplies may be obtained at Bayview. Yachts of any size can come alongside the wharf. A pavilion built on the wharf is a prominent object.

Blount Creek empties into Pamlico River from southward, 2½ miles westward of Mauls Point Light. A draft of 6 feet (1.8 m) can be taken into the creek, and 4 feet (1.2 m) can be taken about 4 miles above the drawbridge which crosses about ⅜ mile above the entrance.

Tides.—There are practically no tides, the variations in water level being due principally to winds. Easterly winds cause high water and westerly winds low water, the maximum variation with heavy gales amounting to about 2 feet (0.6 m) above or below the normal in the lower part of the river and 3 or 4 feet (0.9 or 1.2 m), or even more at Washington. Freshets of 10 to 20 feet (3.0 to 6.1 m) occur in the upper reaches of the river above Washington but have little effect at and below the town.

DIRECTIONS, PAMLICO RIVER

From Pamlico Sound to Washington (charts 1231, 537).—Directions from Croatan Sound through Pamlico Sound are given on page —.

From a position about 100 yards off *Bluff Shoal Slue Buoy No. 1* steer 271° true (W. ⅝ N. mag.) for 11 miles, passing about 200 yards south of *Lower Middle Ground Buoy* (horizontally striped buoy at the southeasterly end of Lower Middle), to a position abeam of and ¾ mile south of Inner Middle Ground Light.

Then steer 306° true (NW. ⅜ W. mag.) for 9⅕ miles to a position about ½ mile northeastward of Pamlico Point Light and off *Pamlico Point Bell Buoy No. 1.*

Then steer 299½° true (NW. ⅞ W. mag.) for 6 miles to a position 200 yards southeastward of *Wade Point Junction Lighted Buoy.*

From this position steer 284° true (WNW. ¼ W. mag.) for 10⅝ miles to a position 300 yards southward of Rumley Marsh Light. Then steer 292° true (NW. by W. ½ W. mag.) for 4¼ miles to a position ¼ mile northward of *Core Point Shoal Buoy No. 5* (black can) off **Core Point.**

Then steer 286° true (WNW. ⅛ W. mag.) for nearly 3¾ miles to a position 200 yards north of Mauls Point Light. From a position 200 yards north of Mauls Point Light steer 279° true (WNW. ¾ W. mag.) for 0.8 mile until up to *Channel Buoy No. 6.*

Channel Buoy No. 6 marks the entrance to the dredged channel to Washington. The channel has a controlling depth of 12 feet (3.7 m) and is well marked by buoys and lights. The chart is the best guide.

When up to the draw of the railroad bridge at Washington, pass preferably through the eastern opening, and continue in mid-channel to the wharves, which should be followed at a distance of about 150 feet. Vessels should go to the wharves.

A dredged channel leads eastward from the main channel, 300 yards above Rodman Point Shoal Light, thence parallel to the shore to the dock of the chemical factory near **Austin Point.** The entrance to this channel is marked by *Fertilizer Works Channel Buoy No. 10* (red spar), located at the south side of the junction with the main channel.

DIRECTIONS, PUNGO RIVER

Pamlico River to Belhaven (charts 1231, 3253).—Having followed the directions from Pamlico River above, pass ½ mile northeastward of Pamlico Point Light and off *Pamlico Point Bell Buoy No. 1* and steer 312° true (NW. ⅛ N. mag.) for 7½ miles to a position about ½ mile westward of *Pungo River Buoy No. 2.* Then steer 347° true (N. ¾ W. mag.) for 1.6 miles to a position 200 yards east of Pungo River Light No. 3 off **Grassy Point.**

If coming down Pamlico River, pass southward and eastward of *Wade Point Junction Lighted Buoy* and steer 347° true (N. ¾ W. mag.) for 3¾ miles to a position about 200 yards east of Pungo River Light No. 3 off **Grassy Point.**

Steer 340° true (N. by W. ⅜ W. mag.) to a position about 250 yards west of *Pungo River Buoy No. 4;* thence 343° true (N. by W. ⅛ W. mag.) to a position 100 yards east of *Pungo River No. 5;* thence 7° true (N. by E. mag.) to a position 250 yards to the east of Pungo River Light No. 7.

From a position 250 yards east of Pungo River Light No. 7 steer 330° true (NNW. ¼ W. mag.) to a position 300 yards to the westward of *Pungo River Bouy No. 8;* thence with Woodstock Point astern, stand up the channel on course 3° true (N. ¾ E. mag.) until abeam of the entrance to the dredged channel to Belhaven. Stand up the channel to **Belhaven,** passing betwen the red nun and black spar buoys marking the entrance.

The channel to Belhaven is well marked by buoys and lights. The controlling depth is 12 feet (3.7 m). Chart 1231 is the best guide. Vessels go alongside the wharves or anchor west of the channel off the wharves.

BAY RIVER

(Charts 1231, 3253)

Bay River empties into the western part of Pamlico Sound from westward, the entrance being just north of the mouth of Neuse River and about 5 miles north-northeastward of Neuse River Light-

house. The entrance is marked by Maw Point Shoal and Bay Point Lights. The channel for a distance of 11 miles above the entrance is marked by buoys and lighted beacons, has a depth of 9 feet (2.7 m) or more, and can be readily followed. Above this point the channel is a cut dredged 150 feet wide and 9 feet (2.7 m) deep to a point ⅝ mile below **Stonewall**, and thence 100 feet wide and 9 feet (2.7 m) deep to **Bayboro**, which is practically the head of navigation. The controlling depth to Bayboro was 8 feet (2.4 m) in January 1936.

The route of the **Intracoastal Waterway** follows **Gale Creek** and **Bay River** to Pamlico Sound.

Vandemere is a village and railroad terminal 8 miles above the entrance of Bay River. The railroad dock is now in ruins but there are depths of from 7 to 8 feet (2.1 to 2.4 m) at the ends of the small fish docks. Gasoline and some supplies are available. There is good anchorage in 9 feet (2.7 m) of water off the docks.

Stonewall is a small village on the south side of Bay River 13 miles above the entrance. The docks are in ruins.

Bayboro is a small village 14 miles above the mouth of the river and at practically the head of navigation. Some small boats pass above the bridges. The wharves are in good condition, and are on the east side of the creek leading to Mill Pond. There are depths of from 8 to 10 feet (2.4 to 3.0 m) at the oil docks and 6 feet (1.8 m) at the fish docks. Ice, gasoline, and some supplies are obtainable. Lumber and fish are shipped by rail from Bayboro.

Directions, Bay River—*From eastward.*—With a smooth sea, a depth of 6 feet (1.8 m) can be taken across Brant Island Shoal by passing about 250 yards southward of Brant Island Slue Light on a southwesterly course. From a position ½ mile southwestward of Brant Island Slue Light steer 265° true (W. mag.) for 6.6 miles to a position ½ mile east of *Bay River Buoy No. 8* (red nun); or from a position ½ mile southward of Brant Island Shoal Light make good a course of 280½° true (WNW. ⅝ W. mag.) for 11½ miles to a position ½ mile east of *Bay River Buoy No. 8*. Then steer 306° true (NW. ⅜ W. mag.) for a distance of 2¼ miles to a position 500 yards northward of Bay River Light No. 3.

From this position steer 266° true (W. mag.) for 1 mile, giving the southern shore a berth of about ½ mile, and then keep near the middle of the river, giving the buoys a berth of over 100 yards until westward of *Bay River Buoy No. 8*.

(*If bound for Vandemere*, after passing Petty Point and ¼ mile northeastward of Bay River Light No. 5, steer 318° true (NW. ⅝ N. mag.) for the wharves.)

Then give the northern shore of Mason Bay a berth of ¼ mile and follow the buoys at a distance of 75 to 100 yards. Anchorage can be selected in the channel of the river up to the entrance of the dredged cuts about 150 yards northwestward of *Bay River Buoy No. 11*, but above this point there is not room for anchorage except for small craft. The channel to Bayboro follows midstream, but local knowledge is necessary to carry the best water.

From westward.—Pass 200 yards eastward and northeastward off *Maw Point Shoal Junction Bell Buoy* and steer 306° true (NW. ⅜ W. mag.) for 3¾ miles to a position 500 yards north of Bay River Light No. 3. Then follow the directions in the preceding paragraphs.

NEUSE RIVER

(Charts 1231, 538)

Neuse River empties into the western end of Pamlico Sound from westward and is one of the important rivers in North Carolina. Its mouth, which is 5 miles wide, is reduced to a navigable width of a little over 2 miles by shoals extending offshore from each side. Neuse River Light marks the outer end of the shoal on the northern side; and the southern shoal, off Point of Marsh, is marked by a light at its outer end. Garbacon Shoal, 10 miles above the mouth of the river, extends halfway across from the southern shore, leaving a clear navigable width of ⅞ mile; the outer end of the shoal is marked by *Garbacon Shoal Lighted Buoy 1A*. Garbacon Shoal Beacon is located in the former position of Garbacon Shoal Light.

The channel has been improved by dredging and snagging operations. From the entrance of the river to New Bern the channel is marked by lights and buoys.

In 1936 there was a depth of 12 feet (3.7 m) from the mouth to New Bern; thence 4 feet (1.2 m) to a point 21 miles above New Bern; thence 2½ feet (0.8 m) to the mouth of **Contentnea Creek**; and thence 1 foot (0.3 m) to **Seven Springs**, 65 miles above New Bern.

The vessel *Elizabeth* burned to the water's edge and was abandoned 2 miles east-northeast from Neuse River Light, July 1934. Later the wreck could not be found.

New Bern, a city on the west bank of Neuse River, population 11,981 in 1930, 34 miles above the entrance, is the county seat of Craven County and is an important commercial center for this district. It ships lumber in barges, and fish and farm produce by rail. There is regular freight-boat service to Norfolk and to Albemarle and Pamlico Sound ports.

Anthracite and bituminous coal, gasoline, Diesel oil, supplies, water, and ice can be obtained. There is a marine railway with a capacity of 100 tons, 75 feet (22.9 m) maximum length, on the north side of Trent River between the railroad and highway bridges. The depth of water off the railway is 12 feet (3.7 m).

There is a relief station (third class) of the United States Public Health Service, and storm warnings are displayed. The river water is slightly brackish at New Bern except during freshets. The United States Coast Guard Cutter Pamlico is stationed at New Bern.

Turnagain Bay is on the south side of Neuse River, south-southeastward of Neuse River Light. It has a depth of 9 feet (2.7 m) or more in a narrow channel for a distance of 3 miles above the entrance; the entrance is marked by private buoys. The old canal to Long Bay is closed.

Broad Creek entrance is on the north side of Neuse River, 1¾ miles westward of Neuse River Lighthouse. Lower Broad Creek Light (black slatted structure) marks the west side of the channel at the entrance. **Pamlico** is a post office and sawmill on the south side of Broad Creek, 2½ miles above the entrance. Vessels load to a depth of 6 feet (1.8 m) on the eastern side of the slab wharf at the sawmill and anchor off the mouth of **Tar Creek** to load to 8 feet (2.4 m). To enter Broad Creek, pass 100 yards eastward and northward

of Lower Broad Creek Light and steer 266° true (W. mag.) until past the point of the shoal, which shows by discolored water, on the starboard hand; then steer northwestward, slightly favoring the western bank until abreast the turning point on that side, and then keep in mid-creek.

South River is on the south side of Neuse River, 6 miles south-southwestward of Neuse River Lighthouse. The channel at the entrance is marked by buoys, and on its west side by South River Light. The channel has a depth of 10 feet (3.0 m) or more for 5½ miles, and 8 feet (2.4 m) for 7 miles, above the entrance. To enter South River, steer 153° true (SSE. mag.) for South River Light in range with the southernmost point that shows on the east side of the creek until up with *Entrance Buoy No. 1*, and then change the course so as to pass close to the light. When 100 yards past the light, change the course gradually to 193° true (S. by W. ½ W. mag.), giving the edge of the bank, which shows by discolored water and is steep-to, on the west side of the channel a berth of 75 to 100 yards, and pass 100 yards westward of *Inner Buoy No. 3*. Then keep in mid-river. There was formerly a sawmill at Coffee Creek, a small bight on the east side of the river about 2½ miles from the entrance beacon. The depth in the creek is 4 feet (1.2 m) and there are a few old wharves on the south side.

Oriental is a post office and railroad terminus on the eastern side of **Smith Creek** opposite Adams Creek. It is an excellent anchorage for boats, and supplies, gasoline, ice, and water can be obtained here and repairs to gasoline engines made. There is a marine railway capable of hauling vessels to 50 feet in length.

There is a depth of 8½ feet (2.6 m) in the channel and about 8 feet (2.4 m) at the principal wharves. A sand spit of dredged material extends southwestward of the channel from the eastern point at the entrance, and the cove northward of it has been dredged to 10 feet (3.0 m). The best anchorage is in the cove, but vessels of 7-foot (2.1 m) draft can anchor westward of the sawmill wharf toward the entrance of Green Creek. Gasoline may be obtained from a wharf in the cove.

A depth of about 8 feet (2.4 m) can be taken into **Green Creek** to the wharves of Oriental in the cove by steering about 308° true (NW. ¼ W. mag.) for Chadwicks Point Shoal Light. Pass 100 feet westward of the light and steer 341° true (N. by W. ½ W. mag.) for the end of the sawmill wharf. Avoid the shoal making out from the sand spit at the entrance to the harbor. After passing this spit, and about 100 yards beyond Oriental Light, the cove may be entered for an anchorage. There are two small wharves on the north side of this bight. The town dock is at the extreme inner end of the cove.

Adams Creek entrance is on the south side of Neuse River, 10 miles above Neuse River Lighthouse and southward of the town of Oriental, on the opposite side of the river. It is a part of the **Intercoastal Waterway** betwen Pamlico Sound and Beaufort Harbor.

A channel has been dredged to a depth of 12 feet (3.7 m) through Adams Creek, and thence through a canal and dredged channels in **Core Creek** and **Newport River** to **Beaufort Harbor**. This channel

is well marked and easily followed in the daytime. It had a controlling depth of 11 feet (3.4 m) in January 1936.

The distances through the channel are as follows: Adams Creek entrance to north end of canal, 5 miles; to south end of canal, 10½ miles; to Morehead City Bridge, 16 miles. Three drawbridges cross the channel, one with a clear opening 60 feet wide over the canal 1 mile from its south end, and the Morehead City railroad and highway bridges, which lie close together and have clear openings 50 feet wide.

From Core Creek Light No. 19 there is a dredged cut channel called **Gallant Channel** leading direct to Beaufort. Lights and buoys mark the channel, the east side of which bares at low water. It has a least width of 60 feet and had a depth of 10 feet (3.0 m) in January 1936. There is a tide staff at the north entrance on Core Creek Light now showing zero at low water and reading to 4 feet. Two drawbridges, close together, with clear width of 50 feet cross the channel near Beaufort.

Clubfoot Creek empties into Neuse River from southward about 14 miles above Neuse River Light. Clubfoot Creek Light is located in a depth of 6 feet (1.8 m), on the eastern side of the entrance. The channel in the entrance, southward of the light, is narrow, with shoals which rise abruptly on both sides. There is a depth of 9 feet (2.7 m) through the entrance, 7 feet (2.1 m) for 2½ miles, and 5 feet (1.5 m) for 3½ miles above Clubfoot Creek Light. **North Harlowe** is a post office on the west side of the creek, and there are two sawmills on the east side. From the creek there is a passage, good for a depth of 3½ feet (1.0 m) at high water, through the **Clubfoot Canal** and **Harlowe Creek** to Beaufort Harbor. To enter Clubfoot Creek, pass 200 yards westward and southwestward of Clubfoot Creek Light, steer about 143° true (SE. by S. mag.), slightly favor the east bank until approaching the old mill wharves on the west side northward of **Nitchell Creek**, and then keep in midcreek.

Hancock Creek is on the south side of Neuse River, nearly 3 miles west-southwestward of Wilkinson Point Shoal Light. A depth of about 4 feet (1.2 m) can be taken into the creek. The entrance is marked by *Hancocks Creek Buoy No. 2*.

Slocum Creek is on the south side of Neuse River, 4½ miles westward of Wilkinson Point Shoal Light. There is a depth of 4½ feet (1.3 m) in the channel of the creek to the forks, a distance of 4½ miles, and up the west branch for 2½ miles farther to **Havelock**, a post office on the railroad. Slocum Creek Light marks the entrance, and otherwise the chart is the guide. Pass to eastward of the light.

Beard Creek is on the northeast side of Neuse River, 4 miles northwestward of Wilkinson Point Shoal Light. A depth of 5 feet (1.5 m) can be taken about 4½ miles up the creek to the county bridge. The entrance to Beard Creek is marked by Beard Creek Light, to be passed on the port hand in entering.

Goose Creek is on the northeast side of Neuse River, 6 miles below New Bern. A depth of 7 feet (2.1 m) can be taken about 4½ miles up the creek.

Upper Broad Creek is on the northeast side of Neuse River, 5 miles below New Bern. A depth of 7½ feet (2.3 m) can be taken about

10 miles up the creek to Tuly Landing, and 5 feet (1.5 m) about 1 mile farther to the head of navigation at the county bridge.

Neuse River above New Bern has a low-water depth of 4 feet (1.2 m) to a point 21 miles above, thence 2½ feet (0.8 m) to the mouth of **Contentnea Creek**, and thence 1 foot (0.3 m) to **Seven Springs**, 65 miles above New Bern. The river above **Maple Cypress** is navigable only during freshet stages of more than 3 or 4 feet (0.9 or 1.2 m). **Kinston** is reached by light-draft vessels only during freshet stages of variable duration, extending over 6 or 8 months of the year.

Waynesboro Landing (Goldsboro), 85 miles above New Bern, is practically the head of navigation, the river being occasionally cleared of obstructions to that point. Boats have gone up as far as **Smithfield**, 130 miles above New Bern.

Swift Creek, a branch of Neuse River 7 miles above New Bern, has been cleared of obstructions for a distance of 12 miles to the village of **Vanceboro**, the head of navigation, and has minimum width of 50 feet and a depth of 5 feet (1.5 m) or more.

Contentnea Creek, a branch of the Neuse River, 28 miles above New Bern, is now obstructed by a shoal at its mouth and is no longer navigable.

Trent River empties into the Neuse at the southern end of the city of New Beran. In 1936 there was a controlling depth of 12 feet (3.7 m) in the water-front channel (New Bern) at the mouth of Trent River, thence 6 feet (1.8 m) to **Polloksville**, thence 3½ feet (1.1 m) to **Trenton**. At New Bern the river is crossed by two bridges with draws about 35 feet wide.

Tides.—There are practically no tides, the variations in water level being due principally to winds. Easterly winds cause high water and westerly winds low water, the maximum variations with heavy gales amounting to about 2 feet above or below the normal in the lower part of the river and about 3 or 4 feet at New Bern. Freshets of 10 to 20 feet occur in the upper reaches of the river above New Bern, but have little effect at and below the town.

DIRECTIONS, NEUSE RIVER

Pamlico Sound to New Bern.—Directions through Pamlico Sound to Neuse River are given on page 104. The following directions are good for a depth of 11 feet (3.4 m) to New Bern:

Having come to a position 1 mile westward of Point of Marsh Light, as directed on page 104, make good a 238° true (SW. by W. ⅝ W. mag.) course for 9½ miles, passing about 1 mile south of Neuse River Light, ¼ mile southward of *Gum Thicket Shoal Buoy 2A*, to a position ¼ mile westward of *Garbacon Shoal Lighted Buoy 1A*.

Then steer 237½° true (SW. by W. ½ W. mag.) for 5 miles, giving the north shore a berth of about 1 mile, and then steer 255° true (W. ⅞ S. mag.) for 2½ miles to a position about ¼ mile south of Wilkinson Point Shoal Light. Then steer 290° true (NW. by W. ⅞ W. mag.) for 7½ miles to Otter Creek Light.

Pass 50 yards eastward of Otter Creek Light and steer 319° true (NW. ¾ N. mag.) for 1⅞ miles, passing eastward of spar buoys

marking the dredged cut and to a position 50 yards eastward of Hampton Shoal Light.

A vessel reports grounding in Neuse River about 1 mile south of Hampton Shoal and 150 yards northeast of the dredged channel. A depth of 6 feet (1.8 m) was found. Vessels should follow the dredged channel carefully.

Then steer 332° true (NNW. 3/8 W. mag.) for 3¾ miles, heading for Fort Point Channel Light, passing 150 yards eastward of Johnston Point Light.

Pass 150 yards southwestward of Fort Point Channel Light and steer 277° true (W. by N. mag.) for Lower Green Spring Light to a position 100 feet southwestward of *Fort Point Channel Buoy No. 12*.

Then steer 304° true (NW. 5/8 W. mag.) for a standpipe in the western part of New Bern until up with Upper Green Spring Light. Pass 50 yards westward of this light and steer 332° true (NNW. 1/8 W. mag.) for a square brick stack at the southeasterly end of New Bern.

A buoyed channel 300 feet wide leads northward in Neuse River close to the wharves on the eastern side of the city until above the second drawbridge. **Anchorage** can be had on the south side of the city, in the mouth of **Trent River**, below the first bridge, in 10 to 18 feet (3.0 to 5.5 m).

Directions, Adams Creek and Adams Creek Canal—Neuse River to Beaufort Harbor.—The **Intracoastal Waterway** follows this route and directions are given fully in the **Inside Route Pilot, New York to Key West.**

CORE SOUND

(Chart 421)

Core Sound is a narrow and shoal body of water extending along and just inside the beach for a length of 27 miles, from the south end of Pamlico Sound to a point inside Cape Lookout. At its western end Core Sound joins a similar body of water, known as **Back Sound**, and a narrower body north of Harkers Island, known as the Straits, both of which connect with Beaufort Harbor and Inlet, forming an inland waterway for boats of 7 feet (2.1 m) draft between Pamlico Sound and Beaufort Harbor, about 5 miles shorter than the deeper route by way of Neuse River and Adams Creek.

Core Sound varies in width from 2 to 3 miles and has a general southwesterly trend. It is nearly filled with shoal banks, over which the depth ranges from 2 to 4 feet (0.6 to 1.2 m); but an improved channel, well marked by lights, with a controlling depth of 7 feet (2.1 m), winds through the sound. The bars are situated as follows: Harbor Island Bar, at the entrance of Pamlico Sound; Piney Point Bar, off Piney Point, about 15 miles down the sound; and Yellow Shoal, off Bells Point, 6 miles farther southwestward.

A channel 7 feet (2.1 m) deep has been dredged through Taylors Creek from Lenoxville Point, at the western end of the Straits, close along the mainland inside a row of marshy islands to the wharves at Beaufort.

Wainwright Slue is a small anchorage at the entrance to Core Sound about 1 mile eastward of Harbor Island Bar Light. It is

marked by two buoys, and shelter from the sea is afforded by the surrounding shoals, which have from 2 to 3 feet (0.6 to 0.9 m) over them. The depths range from 9 to 19 feet (2.7 to 5.8 m), and vessels anchor in the entrance, or farther in so as to get the best protection from the sea. Entrance to the eastern end of Core Sound is now made through Wainwright Slue and the dredged channel east of **Wainwright Island.**

Thorofare Bay, on the north side of Core Sound, is connected with **Cedar Island Bay** by the **Thorofare,** a dredged canal with a width of 60 feet and a controlling depth of 4½ feet (1.4 m). This forms a boat route into **Pamlico Sound** near the mouth of Neuse River. This waterway is used by local fishermen, and local knowledge is necessary for its navigation, as there are shoals at the canal entrances and the channel is narrow. Thorofare East Light marks the entrance to the canal at the west end of Thorofare Bay. Pass close to and west of the light. There is a 2-foot (0.6 m) shoal in midcanal about ¼ mile westward of the cable ferry. The channel passes north of this shoal.

Atlantic is a small settlement on the north side of Core Sound about 2 miles westward of the entrance to Thorofare Bay. A mail boat passes through Core Sound daily from Atlantic to Portsmouth and Ocracoke. There is highway connection to Beaufort.

Back Sound trends about westward from Core Sound for 6 miles to Beaufort Harbor and varies in width from over 2 miles to ½ mile. Passage to Core Sound, except for very light draft boats, is blocked by a shoal at the junction of the two sounds, over which there is but 3½ feet (1.0 m) of water.

The Straits parallel Back Sound north of Harkers Island and Middle Marshes and offer a through deep passage from Core Sound to the western end of Back Sound. The width is from ⅜ to ¾ mile, but the clear channel is only 100 yards at places. The channel is well marked by lights.

Marshallburg is a small town at the eastern end of **The Straits.** There are several small wharves, and gasoline and some supplies may be obtained. There is telephone connection and a highway leads to Beaufort.

Tidal currents of 1 to 2 knots may be found in the lower part of Core Sound. It has been reported that an inlet has formed through Portsmouth Bank and that a rise and fall of about 1 foot of tide is now experienced in Core Sound.

Directions, Pamlico Sound to Beaufort Harbor by way of Core Sound.—The depths of Core Sound are affected by the winds; northerly and northeasterly winds cause high water and westerly and southwesterly winds low water. Improvement of the route by the dredging of channels across the shoals has made it possible for a draft of 7 feet (2.1 m) to be carried through the sounds from Pamlico Sound to Beaufort Harbor. The channel is well marked by lights; the aids must be relied upon to keep the best water. As a general rule run from light to light. Chart 421 is the best guide. The route through Adams Creek Canal is preferred.

From a position 200 yards off *Bluff Shoal Slue Buoy No. 1* steer 230° true (SW. ⅞ W. mag.) for 6¾ miles to a position 1 mile west of Royal Shoal northwest unused lighthouse (old tower). Then head

for Harbor Island Bar Light on course 193½° true (S. by W. ¾ W. mag.) and continuing on course for 6.6 miles to a position with Hodges Reef Light bearing 90° true (E. ½ S. mag.).

Then steer 173° true (S. ⅛ E. mag.) for 2½ miles to the entrance to Wainwright Slue.

Entering Wainwright Slue be guided by the beacons and lights through the slue and the dredged channel east of **Wainwright Island** to the deeper waters of Core Sound. The dredged channel is narrow but the edges of the cut are visible.

In calm weather a draft of 4½ feet (1.4 m) can be carried over the bar westward of the entrance to Wainwright Slue by keeping Harbor Island Light on range with the house on Harbor Island, passing about 100 feet west of the light and heading for a position about 150 yards northwest of Goulds Lump Light.

From a position about 150 yards northwest of Goulds Lump Light steer about 190° true (S. by W. ⅜ W. mag.) to East Drum Shoal Light; thence about 256° true (W. ¾ S. mag.) for 1⅜ miles to West Drum Shoal Light; thence about 217° true (SW. ⅜ S. mag.) for 1⅝ miles to Lewis Creek Light; thence 226° true (SW. ½ W. mag.) for 3½ miles to White Point Light; Halls Point Light is left ¼ mile to starboard on this course.

Pass through the dredged cut to a position about 100 yards north of Atlantic Light. The spoil bank at the south edge of the channel is visible in clear weather. Then steer 222° true (SW. ⅛ W. mag.) for 2⅜ miles, passing Steep Point Light, and to Mill Point Light; thence 265° true (W. mag.) for ⅞ mile to Nelson Bay Light; thence 220° true (SW. mag.) for 1⅞ miles to Piney Point Light.

From Piney Point Light the channel trends west by south (magnetic) for ½ mile to Bretts Point Light; thence through a dredged channel through the shoals to Kings Point Light. Stakes were visible on the south spoil bank in 1935.

From Kings Point Light the channel trends 205° true (SSW. ⅝ W. mag.) for 3¾ miles, passing Davis Shore Light and to Davis Island Light.

Thence 244° true (WSW. ⅛ W. mag.) for 1⅜ miles passing through the dredged channel to Jarretts Bay Light. Stakes were visible in 1935 on the south side of the cut.

From Jarretts Bay Light the dredged channel trends 157° true (S. by E ⅝ E. mag.) for 1¼ miles to Bells Point Light. Stakes were visible on the east side of the cut near Jarretts Bay Light.

From Bells Point Light the channel trends 244° true (WSW. ⅛ W. mag.) and across the shoal through a dredged cut to Straits Entrance Light, and continues westward through the **Straits**. The channel is narrow but well marked by lights. **Marshallburg** is a small town at the eastern end of the Straits. A vehicle ferry runs from **Gloucester Point** to the settlement of **Harkers Island** in **Westmouth Bay.**

From Westmouth Bay Light head for a point about 200 yards off the northwest point of **Harkers Island.** When abreast of this point pass through the dredged cut east of North River Light. From North River Light the channel crosses in a south-southwest direction to Shepherd Shoal Light, thence westward to Middle Marshes Light, thence west-by-north to Taylors Creek East Light, at the entrance to

the dredge cut which leads through **Taylors Creek**, close along the mainland, to the wharves at **Beaufort**.

To enter the cut, pass about 15 yards to the westward of the light and head for the eastern edge of the trees on **Lenoxville Point**. When abeam of the end of **Carrot Island**, head for the stack at the fish factory until the channel opens up to westward. Thence the channel holds westward between the mainland and spoil banks and islands. There is a beacon and a light off the waterfront at Beaufort; pass about 40 yards south of the beacon and about 20 yards south of Taylors Creek West Light. The channel abreast the city has been widened and has a controlling depth of 12 feet (3.7 m).

6. CAPE LOOKOUT TO CAPE FEAR, INCLUDING BEAUFORT AND WILMINGTON, N. C.

(Charts 1233, 1234, 1235, 420, 777)

COAST FROM CAPE LOOKOUT TO CAPE FEAR

The coast extends about 8 miles in a northwesterly direction from Cape Lookout and then curves gradually westward and southward to Cape Fear. This coast, nearly 100 miles in length, is similar to that between Cape Hatteras and Cape Lookout, but the strips of land forming it are separated from the mainland by much narrower bodies of water, and consequently the thick woods of the mainland can be seen from much farther seaward. That part of the Atlantic Ocean bordering on this curved coast is known as **Onslow Bay.**

The depths along this stretch of coast are very regular; 4 to 6 fathoms (7.3 to 11.0 m) can be taken to within 1½ miles of the beach; the 10-fathom (18.3 m) curve extends nearly parallel to, and at an average distance of about 8 miles from the shore until eastward of Cape Fear, where it bends southward and eastward around Frying Pan Shoals. The 20-fathom (36 m) curve is from 20 to 45 miles offshore.

BEAUFORT HARBOR

(Chart 420)

Beaufort Harbor is the southern entrance to the inland waterway between Beaufort and Norfolk Harbors and is the most important harbor on the coast between Cape Henry and Cape Fear. The most prominent and easily recognized objects are the hotel about 3½ miles west of Morehead City, the standpipe at the eastern end of Morehead City, the marine biological station on Pivers Island, near Beaufort, and the water tank in Beaufort.

Beaufort Entrance is about 7½ miles westnorthwestward of Cape Lookout Lighthouse and is obstructed by a shifting bar which extends 1½ miles seaward. A channel 300 feet wide has been dredged across the bar along the bearing 8° true (N. by E. ⅛ E. mag.) on the tank in Beaufort. In January 1936 the controlling depth in the channel was 22½ feet (6.9 m). *Beaufort Harbor Entrance Lighted Buoy* marks the entrance. The channel is marked by buoys and lights. Inside the bar there is a depth of 3 to 5½ fathoms (5.5 to 10 m) in the channel and secure anchorage for vessels anywhere in

the channel from **Fort Macon**, a prominent object on the western side of the entrance, to the highway bridge.

Shackleford Point, the western end of **Shackleford Banks** which lie between Back Sound and the sea, is at the eastern side of the entrance.

Fort Macon Coast Guard Station is just westward of Fort Macon. The cupola of the Coast Guard Station is visible from seaward.

Core Creek is a part of the **Intracoastal Waterway** between Beaufort Harbor and Pamlico Sound.

Newport River is a broad, shallow stream emptying into the head of the harbor. Clubfoot Canal formerly led into this river, but it is now closed by a bar, bare at low water at the south end, and also by a low fixed bridge 1 mile north of the entrance.

Beaufort, population 2,957 in 1930, a town on the eastern side of the harbor, is the terminus of a branch of the Norfolk Southern Railroad and has communication by highway and telephone and telegraph, and highway and power-boat communication with the villages along Core and Pamlico Sounds. Anchorage room near the town is limited, but there are several small wharves to which a draft of 11 feet (3.4 m) can be taken at low water; small boats sometimes anchor in the channel off the wharves, which has a depth of 11 feet (3.4 m). Beacons mark a shoal at the east end of the water front.

Gasoline, Diesel oil, provisions, water, and some ship chandlery can be obtained. A small supply of coal is kept on hand, and larger quantities can be had by giving notice well in advance. There are railways for hauling out vessels of 4 feet (1.2 m) draft and 40-foot length and machine shops for ordinary repairs to motors.

The town of Beaufort is reached from the southward through **Bulkhead Channel** dredged 100 feet wide and 12 feet (3.7 m) deep. There is a jetty, submerged at high water, on the west side of the channel entrance, marked by Shark Shoal Light No. 1 (red and black slatted pile structure) at the south end.

To enter pass about 100 feet eastward of Shark Shoal Light No. 1 and steer north-northwestward for ¼ mile (following the jetty) to pass east of Shark Shoal Light No. 2.

Then steer north-northeastward to pass east of Reids Creek Light and west of the red nun buoy off the west end of **Town Marsh Island.**

When up to the buoy, pass about 50 yards to northward, and steer 82° true (E. ⅜ N. mag.), and then follow the south and east sides of the marshy island north of Town Marsh at a distance of about 75 yards until off the western end of the wharves; then haul southeastward along the wharves.

A dredged channel 60 feet wide and 10 feet (3.0 m) deep leads northward from Beaufort through **Gallant Channel** to the main channel of the **Intracoastal Waterway** between Beaufort Harbor and Pamlico Sound.

The channel is crossed at Beaufort by two drawbridges (opening 60 feet wide), from which it trends northward for ⅜ mile to Gallant Channel Light No. 9 off the fish-factory wharf, then 315° true (NW. ½ N. mag.) for ⅝ mile toward Newport Marshes Light No. 22 to Gallant Channel Light No. 2, then 37° true (NE. ⅜ N. mag.) for nearly ⅝ mile to Gallant Channel Light No. 8, and then 348° true (N. ¾ W. mag.) for ⅞ mile to Core Creek Light No. 19, on

the east side of the main channel of the **Intracoastal Waterway.** The channel is not difficult at low water, the sides of the cut then showing by a difference in the color of the water.

A channel, improved by dredging to 7 feet (2.1 m), leads from off the wharves at Beaufort eastward through Taylors Creek, The Straits, Core Sound, and Wainwright Slue to Pamlico Sound. It is well marked by lights.

Morehead City, population 3,483 in 1930, a town on the western side of the harbor, has communication by railroad, telegraph, and telephone, and is a shipping point for oysters, fish, and clams. Coal, gasoline, Diesel oil, ice, fresh water, and provisions are obtainable. A marine railway at Morehead City is capable of hauling out vessels of 25 tons and 50-foot length. There is a Coast Guard base at Morehead City.

In January 1934 a channel 12 feet (3.7 m) deep existed from the outer harbor to Tenth Street, and a channel 6 feet (1.8 m) deep connected the western end of the harbor with **Bogue Sound.** There is a strong current in the channel off the wharves which must be considered in handling the larger types of vessels.

Directions.—From a position 100 yards north of *Channel Buoy No. 1* (black can) head directly for the standpipe at Morehead City, passing about 50 yards off Morehead City Channel Light, until abeam of the first marshy island about 225 yards northwest of this light, then change course about 20° to the left and run parallel to the wharves.

Atlantic Beach on the ocean side of Bogue Banks, directly opposite Morehead City, is a popular beach resort. It is connected with Morehead City by means of a bridge.

Anchorage can be had in the channel of Beaufort Harbor from Fort Macon to the railroad bridge, and vessels of 8-foot (2.4 m) or less draft can anchor, convenient to Morehead City, in the channel of Bogue Sound westward of buoy no. 3.

Pilots will come out to a vessel if the sea will permit them to cross the bar. They can also be obtained at Beaufort to take vessels along the coast and into the inlets between Beaufort and Winyah Bay or along the **Intracoastal Waterway.**

The following are extracts from chapter 104, Revised Laws of North Carolina, 1905, governing pilotage and harbor regulations in the State of North Carolina.

4969. Rates of pilotage for Old Topsail Inlet and Beaufort Harbor.—The pilotage for Old Topsail Inlet and Beaufort Harbor shall be as follows: For vessels drawing eight feet and under, two dollars per foot; ten feet and over eight, two dollars and fifty cents per foot; twelve feet and over ten, three dollars and fifty cents per foot; all over twelve feet, four dollars per foot. The above fees to be collectible in Beaufort Harbor from Middle marsh to Lewis thoroughfare. For every vessel piloted without these bounds an additional charge of fifty cents per foot may be charged. The commissioners shall have the same printed or written on every license or branch issued by them, and every pilot shall exhibit his license to the master of every vessel he has in charge, when demanded by said master. No vessel entering Old Topsail Inlet without a pilot shall be required to take one on going to sea; nor shall any vessel be required to take a pilot that has to enter the harbor in distress. (*As amended 1909.*)

4970. Vessel under sixty tons not liable for pilotage.—No pilot, acting under the authority of the commissioners of navigation for Old Topsail Inlet, shall be entitled to pilotage for any vessel under sixty tons burden, unless such

vessel shall have given a signal for a pilot, or otherwise shall have required the assistance of a pilot.

4972. Rates of pilotage for Bogue Inlet.—The branch pilots for Bogue Inlet shall be entitled to receive of the commander of such vessel as they may have charge of, the following pilotage, namely: For bringing any vessel into the said inlet, drawing less than seven feet from the outside of the bar to the anchorage before the town, or the customary place in Hill's channel, one dollar per foot; for a vessel drawing more than seven feet, one dollar and fifty cents per foot; and the same fees for pilotage outward as inward.

4978. Pilots refused, entitled to pay.—If a branch pilot shall go off to any vessel bound in, and offer to pilot her over the bar, the master or commander of such vessel, if he refuses to take such pilot, shall pay to such pilot, if not previously furnished with one, the same sum as is allowed by law for conducting such vessel in, to be recovered before a justice of the peace, if the sum be within his jurisdiction: *Provided*, That the first pilot, and no other, who shall speak such vessel so bound in shall be entitled to the pay provided for in this section.

4980. Rates of pilotage annexed to commission.—The commissioners of navigation for the several ports of this State shall annex to the branch or commission, by them given to each pilot, a copy of the fees to which such pilot is entitled.

Supplies.—Coal, gasoline, Diesel oil, ice, fresh water, provisions and some ship chandlery can be obtained at Morehead City or Beaufort. Repairs can be made to small craft, which can be hauled out at both places.

Hospital.—The nearest marine hospital is at Norfolk, Va. There are relief stations of the United States Public Health Service at Beaufort and Morehead City.

Storm warnings are displayed at Beaufort and Morehead City. There is a Coast Guard station near Fort Macon, and a Coast Guard base at Morehead City.

Tides.—The mean range of tides at Beaufort is 2.7 feet (0.8 m).

Currents.—The tidal currents in the entrance run with considerable velocity, especially during spring tides. They generally follow the direction of the channel, but on the last quarter of the flood and first of the ebb they are apt to set across the shoals in the entrance.

DIRECTIONS, SEA BUOY TO BEAUFORT HARBOR AND MOREHEAD CITY

Courses and distances

[Abbreviations: Lt. light; dist., distant]

(For reverse direction read upward)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. Beaufort Harbor Entrance, Lighted Buoy, bearing W., dist. 50 yards. Follow the dredged channel across the bar until 200 yards east of Fort Macon Shoal Lt. This course leads directly for Beaufort Water Tank:			*Nautical miles*
Direct	° 8	*Points* N. by E. ⅛ E	1.6
Reverse	*188*	*S. by W. ⅛ W*	*1.6*
2. Fort Macon Shoal Light, bearing W., dist. 200 yards. This course leads directly for Reids Creek Lt.:			
Direct	340	N. by W. ⅜ W	.4
Reverse	*160*	*S. by E. ⅜ E*	*.4*

DIRECTIONS, SEA BUOY TO BEAUFORT HARBOR AND MOREHEAD CITY—Continued.

Courses and distances—Continued

[Abbreviations: Lt. light; dist., distant]—Continued

(For reverse direction read upward)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
3. **Tail of Shackleford Middle Ground Buoy No. 8** (red nun), bearing N., dist. 100 yards:			
Direct	290	NW. by W. ⅞ W.	0.7
Reverse	*110*	*SE. by E. ⅞ E.*	*.7*
4. **Shark Shoal Buoy No. 10** (red nun), bearing NE., dist. 100 yards:			
Direct	322	NW. by N.	.85
Reverse	*142*	*SE. by S.*	*.85*
5. **Junction Buoy,** bearing NE., dist. 200 yards:			
Direct	299	NW. by W. ⅛ W.	.3
Reverse	*119*	*SE. by E. ⅛ E.*	*.3*
6. **Channel Buoy No. 3** (black can), bearing S., dist. 100 yards. Head directly for the standpipe at Morehead City, passing 50 yards off Morehead City Channel Light, until abeam of the first marshy island about 225 yards northwest of this light, then change course about 20° to the left and run parallel to the wharves:			
Direct	------	Various	.6
Reverse	------	*Various*	*.6*
7. **At principal wharves in Morehead City.**			

BEAUFORT ENTRANCE TO CAPE FEAR RIVER

(Charts 1234, 1235, 777, 420, 422, 3253, 3254)

Westward of Beaufort Harbor the **Intracoastal Waterway** affords a protected and inside passage to **Cape Fear River.** This waterway, 93.5 miles long, passes through Bogue Sound to Bogue Inlet, and then through dredged cuts following the general line of the coast to Cape Fear River, which it enters about 16 miles below Wilmington. The controlling depth, January 1936, was 12 feet (3.7 m) from Beaufort Harbor to Cape Fear River. This route is fully described in the **Inside Route Pilot, New York Harbor to Key West.**

There are several inlets between Beaufort Entrance and Cape Fear River through which 6 or 7 feet (1.8 or 2.1 m) can be carried to sheltered anchorage, but these are all obstructed by shifting bars, on which the sea breaks when at all rough.

An onshore wind, even if light, will cause a heavy break on the bars, while an offshore wind may be heavy without making the bars dangerous. Strangers in small craft should not leave a sheltered anchorage bound southward with the wind anywhere between southeast and southwest and should make an anchorage as soon as possible after the wind begins to blow from these directions. In entering or leaving the inlets the appearance of the water is the best guide, as breakers always form on the shoal areas; but strangers should not attempt to enter an inlet when breakers form entirely across it.

With local knowledge, a smooth sea, and high water, boats can cross Frying Pan Shoals through **Cape Fear Swash**. Due to extensive shoaling, the buoys marking this passage have been removed. Strangers of over 8-foot (2.4 m) draft are advised to pass outside Frying Pan Shoals, by which route the distance from *Beaufort Harbor Entrance Lighted Buoy* to smooth water in Cape Fear River is 112 miles. Pilots for the inlets, the **Intracoastal Waterway** and open waters between Beaufort and Charleston can be had at Beaufort and Morehead City.

Bogue Sound (chart 1234) is shallow and extends 21 miles westward along the coast from Beaufort Harbor to Bogue Inlet. It is separated from the ocean by Bogue Banks, a wooded beach ⅛ to ¾ mile wide. The sound has a width of about 2 miles near its middle, but narrows at each end; its western end is partly closed by marshy islets. The passage through Bogue Sound by way of the **Intracoastal Waterway** is well marked by lights and strangers should experience no difficulty in following the channel.

Tides in Bogue Sound vary from about 2½ feet (0.7 m) average rise and fall at each end near the inlets, to about 1 foot (0.3 m) where the tides meet near the middle. Strong south or southwest winds may raise the tide a foot or even more, and north to northwest winds lower it a corresponding amount.

Bogue Inlet is 22 miles westward of Beaufort Harbor and 3 miles southward of the town of Swansboro, which can be seen from outside. The entrance is now used almost exclusively by local fishermen. The inlet is between a high, wooded ridge on the west and a long, low spit on the east; on the inside of the spit, 1 mile eastward of the inlet, is a Coast Guard station. The entrance is obstructed by a shifting bar, extending about ½ mile seaward, through which the channel depth varies from a minimum of 3 feet (0.9 m) at low tide in some years to a maximum of 14 feet (4.3 m) at high tide in other years; in March 1933, there was a depth of about 6 feet (18 m) at mean low water on the bar.

The tides have a range of about 2½ feet (0.8 m) on the bar, and high water occurs two hours earlier on the bar than at the head of the marshes inside.

The channel is marked by *Bogue Inlet Sea Bell Buoy*, ½ mile outside the bar, and by small buoys on the bar and in the entrance. The small buoys are shifted frequently to conform with the position of the channel. There are no regular pilots; some one familiar with the channel may sometimes be had from the Coast Guard station. Fishermen are sometimes present outside and can be followed in. A stranger should wait for a rising tide and should never attempt to enter when the bar is breaking. The bar buoys cannot be seen when there is any sea running.

The channels inside the inlet are subject to considerable change, and no directions for navigating them can be given. The greatest changes result from southeast and southwest storms. In March 1933 the channel had a controlling depth of 4 feet (1.2 m) from the inlet to Swansboro.

Swansboro, a small town on the west bank of **White Oak River**, 3 miles north of Bogue Inlet, is reached by a shifting channel from the

inlet, and from Bogue Sound and Cape Fear River through the Intracoastal Waterway. There are several piers with a depth of 9 feet (2.7 m) at the faces. Provisions, ice, and gasoline are obtainable here. There is telephone and telegraph communication and highway connection to Morehead City. Some machine-shop facilities and a marine railway capable of hauling out boats of about 35 feet in length are available. Numerous fishermen base at Swansboro. There is a fixed bridge, vertical clearance of 12 feet (3.7 m) across the White Oak River at the town.

White Oak River, for a distance of 4 miles above Swansboro, has a width of 1 mile or more, through which there is a narrow, tortuous channel between flats and oyster rocks; farther up, the river is narrow and leads between marshes. The channel is marked by red and black stakes. **Stella** is a post office about 7 miles above Swansboro. The limit of navigation is at the fixed bridge at Stella. Lumber is towed through Bogue Sound to Morehead City.

Bear Inlet, 3½ miles westward of Bogue Inlet, is used as a harbor by local boats only. The entrance is about ¼ mile wide between high sand dunes. It has a broad, straight channel and is marked by buoys, which are shifted from time to time as the position of the channel changes. In March 1933, the depth over the bar at low water was 4 feet (1.2 m). The channel is closer to the west side at the mouth of the inlet. The waters connecting the inlet with the **Intracoastal Waterway** have a depth of only 2½ feet (0.8 m) at low water. Strangers should not attempt to enter the inlet, or pass to the **Intracoastal Waterway**, without the aid of a local pilot.

Bear Inlet is easily recognized from the outside. A series of low bare sand dunes extends from the near background of trees at the west side of Bogue Inlet gradually increasing in height to the east side of the entrance to Bear Inlet. The spit on the west side is low sand beach.

Browns Inlet, 3 miles westward of Bear Inlet, had a depth at low water of about 2 feet (0.6 m) in March 1933; it is little used. The entrance is not buoyed; the channel is difficult and should not be attempted by strangers without the aid of a local pilot. The east side of Browns Inlet is much higher than the west side. The dunes to the east are steeper and more ragged looking with overgrown tops. A high bare sand dune is a little more than half-way toward Bear Inlet. This dune slopes up from the west in a rather elongated fashion and is the first thing visible from the southwestward. Like Bear Inlet the west side of Browns Inlet is much lower and smoother looking.

New River Inlet, 35 miles westward of Beaufort Harbor, is not marked, is considered dangerous by local pilots, and should not be attempted except under the most favorable conditions. There is a strong ebb current from the inlet sometimes as long as three hours after low tide, which causes a heavy break on the bar when there is any sea outside. The break is especially bad when the ebb current runs against any winds from south or southeast. In 1933 there were 6 feet (1.8 m) at low tide on the bar, which was broad and showed no well-defined channel, and is subject to rapid change. The entrance is narrow, with spits on both sides, and only shows when open. On the western side of the opening there are a wooded hummock,

bare sand dunes, and shanties. There is a group of shanties 1 mile westward of the inlet.

New River is navigable for boats of 5-foot (1.5 m) draft for a distance of 7 miles above Jacksonville. The river has a width of 1 to 2 miles from the head of the marshes above the inlet to 1 mile below Jacksonville, above which it is a narrow stream. From the inlet the channel to New River has a depth of 1½ to 6 feet (0.4 to 1.8 m) and leads northward and northwestward to the northern end of Chadwicks Bay, where it follows the southwest side of a dike. It then follows the western shore at a distance of 200 yards, passes that distance eastward of Hatch Rock, and then turns eastward to the middle of the river.

Jacksonville is a town on the New Bern-Wilmington branch of the Atlantic Coast Line Railroad 20 miles above the mouth of New River Inlet and on the east side of the river. A fixed highway bridge across the river at Jacksonville is the limit of navigation for vessels with masts. Gasoline and some provisions are obtainable at the town.

Tides.—The mean rise and fall at the entrances to these inlets is about 2½ to 3 feet (0.8 to 0.9 m); but freshets, particularly in New River, may raise the level a foot or more inside. On the bars at the entrances of the inlets between Cape Lookout and New River Inlet high and low waters are about ½ hour earlier than at Charleston.

New Topsail Inlet is 18 miles westward of New River Inlet and 53 miles westward of Beaufort Harbor. The channel is unmarked and is obstructed by a shifting bar. A small house stands on the eastern spit, about ⅛ mile from its end. This inlet is used by local boats but should not be entered by a stranger.

Old Topsail Inlet (also called Elmore Inlet) is constantly changing and no directions can be given for its use. Small boats enter the inlet at low water, and at high water they can pass through the inside channels to the **Intracoastal Waterway** and the mainland. Strangers should not use this inlet. The shores on each side are low sand beaches, and there are no distinguishing marks. The inlet between New Topsail and Old Topsail Inlets is practically bare at low water.

Rich Inlet and Mason Inlet (also called Queen Inlet) are 5 and 8½ miles, respectively, westward of New Topsail Inlet and have channel depths over their bars of 2 to 4 feet (0.6 to 1.2 m) at low tide. They are used to some extent as anchorages by small local craft but are not recommended to strangers.

Moores Inlet (also called Wrightsville Inlet) is 11½ miles southwest of New Topsail Inlet and 23¾ miles north-northeastward of Cape Fear Lighthouse. The inlet has closed to the extent that navigation has ceased.

Wrightsville Beach is a summer resort on the beach between Wrightsville Inlet and Masonboro Inlet. The large hotels and buildings are visible from far offshore. An electric railway and a good highway connect Wrightsville Beach with Wilmington. Gasoline and some supplies can be obtained at Wrightsville at the landings on the **Intracoastal Waterway** westward of the railway bridge.

Masonboro Inlet is about 2 miles south of Wrightsville Inlet. The channel and the best water across the bar are marked by buoys which are shifted very frequently to conform with the frequent and radical changes. In 1930, there was a depth of 5 feet (1.5 m) on the bar. Entrance should not be made except with thorough local knowledge and only under the most favorable conditions. In northeasterly weather the bar is bad. There are strong tide rips on the ebb current. The mean range of tide on the bar is 3.85 feet. The **Intracoastal Waterway** on the inside is reached from the bar by proceeding along the north spit to the northeastward and then parallel to the railroad causeway to Wrightsville. This passage is marked by beacons and in 1930, was good for a draft of 5 feet (1.5 m), but was shoaling considerably.

Corncake Inlet, 4 miles north of Cape Fear Lighthouse, is connected with Cape Fear River by several shallow slues north of **Smith Island**. The inlet has shoaled and is seldom used by local fishermen. It is considered dangerous and strangers are advised not to attempt it under any circumstances.

Cape Fear Swash is a narrow channel across **Frying Pan Shoals**, 1 mile southward of Cape Fear Lighthouse and about ¾ mile southward of the point of the cape. It is considered dangerous and is no longer buoyed. Local fishermen occasionally use the passage. A stranger should not attempt to use it.

Four Mile Slue, a channel across Frying Pan Shoals, 5 miles southward of Cape Fear Lighthouse has shoaled to a depth of 4½ feet (1.4 m) and is unsafe for use; the buoys marking it have been discontinued.

Cape Fear is the low, sharp point of sand beach forming the southern extremity of Smith Island. This island, lying on the eastern side of the entrance to Cape Fear River, is mostly low and marshy but has a thick growth of trees on its western side. Near the southern end of the island is Cape Fear Lighthouse, which will usually be the first object seen in approaching the cape.

Cape Fear Lighthouse, Lat. 33°50′47″ N., Long. 77°57′58″ W., is a white, octagonal, pyramidal, iron, skeleton tower, upper part black. The light is flashing white (light 2.5 seconds, eclipse 7.5 seconds), 159 feet (48 m) above the water, and visible 19 miles. The light is obscured from 178° to 190°.

Bald Head Beacon is on the westerly side of Smith Island, easterly side of the entrance to Cape Fear River. The structure is a white, octagonal, pyramidal tower.

Frying Pan Shoals, with general depths of 4 to 10 feet (1.2 to 3.0 m), extend in an unbroken line 10 miles south-southeastward from Cape Fear; for a distance of 5½ miles farther in the same direction the shoals are broken, the depth over them ranging from 10 to 20 feet (3.0 to 6.1 m). *Frying Pan Shoals Lighted Whistle Buoy 2 A F P* is moored in 66 feet (20.1 m) of water, in the former position of the lightship, off the end of this part of the shoals, and *Frying Pan Shoals Lighted Whistle Buoy 2 F P* is moored in 48 feet (14.6 m) of water off the western side of the shoals. Broken ground with depths of 6 to 7 fathoms (10.9 to 12.8 m) extends 8 miles eastward and 12 miles east-southeastward from *Frying Pan Shoals Lighted Whistle Buoy 2 A F P;* the least depth is 5¼ fathoms (9.5 m) and lies 7½

miles 90° true (E. ¾ S. mag.) from the buoy. **Frying Pan Shoals Lightship,** marking the outer end of the shoals, is located on the 10-fathom (18.3 m) curve, 30½ miles 138½° true from Cape Fear Lighthouse. Large, deep-draft vessels generally pass southward of the lightship.

Frying Pan Shoals Lightship, Lat. 33°28′ N., Long. 77°34′ W., is moored on the 10-fathom (18.3 m) curve, 30½ miles 138½° true from Cape Fear Lighthouse. The vessel has a yellow hull, with "Fryingpan" on each side, and two masts with the lantern on the foremast, no bowsprit. The station whistle buoy is 400 yards northerly. The light is group flashing white every 30 seconds (2 flashes, each 2 seconds, 1 eclipse, 6 seconds, 2 flashes, each 2 seconds, 1 eclipse, 10 seconds), 63 feet (19.2 m) above the water, and visible 14 miles. A fixed white light on the forestay indicates the heading of the lightship. The fog signal is two-tone diaphone, blast 4 seconds, silent 26 seconds, excepting that every third minute blasts of 1 second and 5 seconds will be substituted for one of the characteristic blasts. If the oscillator is disabled, a bell will sound 5 strokes in 5 seconds, silent 55 seconds. There is a radiobeacon on the lightship which sends out signals of 2 dashes during foggy weather. (For description see Light List, Atlantic Coast or H. O. Pub. No. 205.) The lightship is a radio station, and receives and transmits messages of importance in the maintenance of aids to navigation or on other urgent matters (see Light List). Call letters WSD. The diaphone and radiobeacon are synchronized for distance finding.

CAPE FEAR RIVER

(Charts 424 and 425)

Cape Fear River has a total length of about 371 miles and empties into the sea immediately westward of Cape Fear. It is the approach to the city of Wilmington, which is 27 miles above its mouth. Frying Pan Shoals Lightship and Cape Fear Lighthouse are the principal guides for the approach and are described with the coast from Cape Lookout to Cape Fear on pages 126 and 127.

The entrance to the river is obstructed by a bar which extends about 2 miles offshore. In 1936 there was a controlling depth of 30 feet (9.1 m) in the dredged channel over the ocean bar, and 29 feet (8.8 m) existed in the river channels up to Wilmington. There was a depth of 30 feet (9.1 m) in the turning basin and in the anchorage basin.

The channel is well marked by range lights and buoys, and with the aid of the chart it should not be difficult for a stranger of moderate draft to navigate it on a rising tide; sailing vessels usually employ a towboat for crossing the bar and in the river.

Western Bar Channel, close to Oak Island at Fort Caswell, is used considerably by small craft bound westward along the coast. It is good for about 6 feet (1.8 m) at low tide but is not buoyed. The best water lies from 100 to 200 yards offshore south of Fort Caswell, and from there the channel through the shoals runs about 256° true (W. by S. mag.). Abreast the Coast Guard station the shore should not be approached closer than ¼ mile.

Southport is a town on the west bank of the Cape Fear River, 1½ miles above Fort Caswell. There is good anchorage in the river

abreast the town and deep water at the wharves. A railroad connects with Wilmington. Fresh water and gasoline can be had at the wharves, and provisions are obtainable in the town. Coal and fuel oil can be obtained from the railroad wharf if ordered in advance. Pilots for the bar and river maintain a lookout tower in Southport. The **Intracoastal Waterway** entrance to the westward is marked by Southport Light No. 1 south of Southport.

Storm Warnings are displayed at Southport.

A channel 100 feet wide with a controlling depth of 8 feet (2.4 m) has recently been dredged eastward and southeastward from a point on the main ship channel about 350 yards southward of buoy 17A to the dock of the Ethyl-Dow Chemical Company on the east side of the river about 5 miles N. by E. of Corncake Inlet.

The **Intracoastal Waterway** channel northward from Cape Fear River leaves the main ship channel opposite the Manhaden Fish wharves on the west side of the river, northward of buoy 17A, and trends 25° true (NNE. ½ E. mag.) with the Intracoastal Waterway Range ahead to beacon 73. Thence 67° true (ENE. ¼ E. mag.), with Canal Entrance Range astern, to the mouth of the land cut to Myrtle Sound. The junction is marked by Junction Light.

Passage from the Intracoastal Waterway to the main channel of the Cape Fear River opposite beacon No. 23 is possible for boats of 4½-foot (1.4 m) draft through the slue leading northward from Canal Entrance Range rear light. This channel is now well marked by beacons. Pass about 200 yards east of Canal Entrance Range rear light and steer 357° true (N. mag.) for 1⅜ miles until abeam of beacon No. 7, thence 330° true (NNW. ⅜ W. mag.) for Liliput Middle Beacon No. 23 ahead, with the end of the ruined Carolina Beach Railroad wharf, on the east side of the river, astern.

Elizabeth River is navigable up to the second fish factory for boats of 5-foot (1.5 m) draft. Entrance is made through the **Intracoastal Waterway**. **Dutchman Creek**, entered from Elizabeth River Channel, is used by boats of 4½-foot draft.

Northwest Branch.—The controlling low-water depths in the northwest branch of the river above Wilmington were 8 feet (2.4 m) to **Kings Bluff** (Lock No. 1), 3 feet (0.9 m) to **Browns Landing** (Lock No. 2), and 2 feet (0.6 m) to **Fayetteville**, June 1934. These depths are secured by dredging and the building of two dams, one at Kings Bluff and the other at Browns Landing, 34 and 64 miles, respectively, above Wilmington. The tidal range at Kings Bluff is about 1 foot (0.3 m). It was reported that with the completion of the lock and dam project a depth of 8 feet (2.4 m) was available to Fayetteville (January 1936).

Northeast River, known locally as **Northeast Branch**, empties into Cape Fear River from northeastward at Wilmington. The governing low-water depths in January 1936 were 15 feet to a point 2¾ miles above the mouth; thence 6 feet to **Bannermans Bridge**, 48 miles above the mouth; thence 3 feet to **Crooms Bridge**, 56 miles above the mouth. Above Crooms Bridge the river is navigable during freshets only, which are liable to occur any month in the year.

Black River empties into Cape Fear River about 12½ miles above Wilmington and has a low-water depth of 5 feet (1.5 m) to **Point**

Caswell, 21 miles; 2½ feet (0.7 m) to Hawes Narrows, 28 miles; and 1½ feet (0.4 m) to Clear Run, 57½ miles. Above Clear Run for a distance of 7 miles to Lisbon the river is so shallow that navigation is practicable only during high-water stages.

Anchorages.—On account of the Government submarine cable, vessels are cautioned not to anchor on or near a line from Bald Head Lighthouse to Fort Caswell. The best anchorage is off the town of Southport, where the depth ranges from 4 to 6 fathoms (7.3 to 10.9 m); the holding ground is good, but, on account of the strong tidal currents, vessels should anchor with a good scope of chain. Vessels should anchor well clear of the range line. This anchorage is sometimes used as a harbor of refuge in the winter by coasting vessels. There is a limited anchorage basin abreast the lower end of Wilmington, on the easterly side of the river just above the mouth of Alligator Creek.

It is reported that the holding ground in the vicinity of the entrance buoy is poor.

DIRECTIONS, CAPE FEAR RIVER

The channel from sea to Wilmington is a dredged cut 300 to 400 feet wide, the currents have considerable velocity, the dredged channel across the bar is subject to a gradual change in position, and strangers are advised to take a pilot. Unless with a local pilot, vessels do not run the river at night; sailing vessels require a towboat.

1. Approaching from northward.—The safer course, and the one generally used by large, deep-draft vessels, is to pass outside of Frying-Pan Shoals Lightship. From a position about 1 mile south of *Cape Lookout Shoals Lighted Whistle Buoy* a course of 229° true (SW. ¾ W. mag.) made good will lead to a position 1 mile south of Frying-Pan Shoals Lightship.

From a position 1 mile south of Frying-Pan Shoals Lightship steer 296½° true (NW. by W. ⅜ W. mag.) for 22¼ miles, passing 0.4 mile south of *Frying-Pan Shoals Lighted Whistle Buoy 2 A F P*, to a position 2½ miles south of *Frying-Pan Shoals Lighted Whistle Buoy 2 F P*. Then steer 162° true (S. by E. ⅜ E. mag.) for 14 miles to a position about 200 yards west of *Cape Fear River Entrance Lighted Whistle Buoy 2 C F*.

1A. Approaching from southward.—The principal danger southward of Frying-Pan Shoals is the broken ground extending off between Cape Romain and Winyah Bay, on which there is a depth of 3¾ fathoms (6.7 m) near the wreck of the *Hector* lying 11 miles from shore. The wreck is marked by a lighted bell buoy. Deep-draft vessels should pass outside of this broken ground, giving the coast a berth of over 12 miles, and this is the safer course for all vessels at night. When clear of the broken ground, the course can be shaped for *Cape Fear River Entrance Lighted Whistle Buoy 2 C F* off the entrance of Cape Fear River. When approaching from the southwestward in daytime, the water tanks on Fort Caswell will generally be picked up before Cape Fear Lighthouse.

Currents.—Except with northeasterly winds, some overrun, probably amounting to 0.5 knot at times, may be expected in approaching from southward. (See currents on pages 31 and 32.)

Courses and distances, Sea buoy to Wilmington

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Cape Fear Lighted Whistle Buoy 2 CF** (Fl. W.), bearing SE., dist. 200 yards. Steer Bald Head Shoal Channel range (front Lt. Fl. W., rear Lt. Occ. W.) ahead; pass west of lighted bell buoy 4, east of buoys 1, 3, and 5, and west of buoys 4A and 6:			
Direct	43	NE. ⅛ E	2. 7
Reverse	*223*	*SW. ⅛ W*	*2. 7*
2. **Bald Head Beacon,** bearing 86° t., dist. ⅜ mile. Steer Smith Island range (front Lt. Fl. R., rear Lt. Occ. W.) ahead; pass east of buoy 7:			
Direct	8	N. by E	. 8
Reverse	*188*	*S. by W*	*. 8*
3. **Lighted Buoy 7A** (Fl. W.), bearing NW., dist. 300 yards:			
Direct	340	N. by W. ½ W	. 3
Reverse	*160*	*S. by E. ½ E*	*. 3*
4. **Smith Island Range Front Light** (Fl. R.), bearing NE. by E., dist. 400 yards:			
Direct	322	NW. ⅞ N	. 9
Reverse	*142*	*SE. ⅞ S*	*. 9*
5. **Battery Island Light 2A** (Fl. R.), bearing NE., dist. about 350 yards. Round Battery Island Lt. 2A at a distance of about 300 yards until the light bears E., and continue to swing gradually to the Lower Swash Channel range:			
Direct	---°	various	. 5
Reverse	---	*various*	*. 5*
6. **Southport Light 1** (Fl. G.), bearing NW., dist. 350 yards. Steer Lower Swash Channel range (front Lt. Fl. W., rear Lt. Occ. W., red sector) ahead; pass midway between buoy 9 and Lower Quarantine Buoy Q:			
Direct	56	NE. by E. ¼ E	1. 4
Reverse	*236*	*SW. by W. ¼ W*	*1. 4*
7. **Quarantine Tank,** bearing SSW., dist. 500 yards.			
NOTE.—Above this point the aids marking the edge of the dredged cuts should be passed at a distance of about 200 yards.			
Steer Snow Marsh Channel range (front Lt. Fl. W., rear Lt. Occ. W., red sector) ahead; pass west of buoy 6A and east of Snow Marsh Channel Light No. 11 (Fl. G.):			
Direct	46	NE. ⅜ E	2. 6
Reverse	*226*	*SW. ⅜ W*	*2. 6*
8. **Buoy 13** abeam (covered by the red Sector of Lower Swash Channel Range rear light). Steer Horseshoe Shoal Channel range (front Lt. Fl. W., rear Lt. Occ. W.) astern; pass west of buoy 6B, and east of buoy 13A:			
Direct	24	NNE. ⅜ E	1. 0
Reverse	*204*	*SSW. ⅜ W*	*1. 0*

Courses and distances, Sea buoy to Wilmington—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
9. **Buoy 13A** abeam (covered by the red Sector of Snow March Channel Range rear light). Steer Reeves Point Channel range (front Lt. Fl. W. rear Lt. Occ. W., red sector) astern; pass west of buoy 10:	°	*Points*	*Nautical miles*
Direct	5	N. ¾ E	1. 0
Reverse	*185*	*S. ¾ W*	*1. 0*
10. **Buoy 10** abeam (covered by the red sector of Upper Midnight Channel Range front light). Steer Lower Midnight Channel range (front Lt. Fl. R., rear Lt. Occ. R.) ahead; pass east of buoy 15 and Midnight Channel Lt.:			
Direct	15	N. by E. ⅝ E	1. 4
Reverse	*195*	*S. by W. ⅝ W*	*1. 4*
11. **Midnight Channel Light** (Fl. G.) abeam. Steer Upper Midnight Channel range (front Lt. Fl. W., rear Lt. Occ. W., red sector) astern; pass east of buoy 17A, west of Junction Light, east of buoy 19, west of buoy 12, east of buoy 19A, and west of Orton Point Lt.:			
Direct	359	N. ¼ E	2. 3
Reverse	*179*	*S. ¼ W*	*2. 3*
12. **Orton Point Light** (Fl. R.) Steer Lower Liliput Channel range (front Lt. Fl. W., rear Lt. Occ. W.) ahead; pass east of buoy 21, west of buoy 14, and east of buoy 23:			
Direct	12	N. by E. ⅜ E	1. 7
Reverse	*192*	*S. by W. ⅜ W*	*1. 7*
13. **Beacon 23** abeam. Steer Upper Liliput Channel range (front Lt. Fl. R., rear Lt. Occ. R.) astern; pass west of buoys 16 and 16A:			
Direct	353	N. ⅜ W	1. 5
Reverse	*173*	*S. ⅜ E*	*1. 5*
14. **Buoy 16A** abeam. Steer Keg Island Channel range (front Lt. Fl. W., rear Lt. Occ. W.) ahead; pass west of buoy 16B:			
Direct	3	N. ½ E	1. 3
Reverse	*183*	*S. ½ W*	*1. 3*
15. **Midway between Beacons 25 and 18.** Steer Big Island Channel Lower range (front Lt. Fl. W, rear Lt. Occ. W.) astern:			
Direct	332	NNW. ¼ W	. 7
Reverse	*152*	*SSE. ¼ E*	*. 7*
16. **Midway between Beacons 25A and 20.** Steer Big Island Channel Upper range (front Lt. F. W, rear Lt. Occ. W.) astern:			
Direct	308	NW. ⅜ W	. 4
Reverse	*128*	*SE. ⅜ E*	*. 4*
17. **Midway between Light 25B (Fl. G) and Beacon 22.** Steer Lower Brunswick Channel range (front Lt. Fl. W., rear Lt. Occ. W.) ahead; pass west of buoys 24 and 26:			
Direct	333½	NNW. ⅛	1. 4
Reverse	*153½*	*SSE. ⅛ E*	*1. 4*

Courses and distances, Sea buoy to Wilmington—Continued

Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
18. **Buoy 26** abeam. Steer Upper Brunswick Channel range (front Lt. Fl. R., rear Lt. Occ. R.) ahead; pass east of buoy 27:			
Direct	11	N. by E. ⅜ E	.9
Reverse	*191*	*S. by W. ⅜ W*	*.9*
19. **Buoy 27** abeam. Steer Fourth Eastern Jetty range (front Lt. Fl. W., rear Lt. Occ. W.) astern; pass east of light 29:			
Direct	5	N. ¾ E	1.0
Reverse	*185*	*S. ¾ W*	*1.0*
20. **Clarks Island Light 29** abeam. Bring Upper Brunswick Range rear light (Occ. R.) slightly on the starboard quarter and pass west of buoy 28:			
Direct	342	N. by W. ⅜ W	.3
Reverse	*162*	*S. by E. ⅜ E*	*.3*
21. **Buoy 28,** bearing SSE. ½ E. dist. 350 yards. Steer Clarks Island range (front Lt. Fl. W., rear Lt. Occ. W.) astern; pass east of buoy 31 and Eagle Island Lt. (Fl. W.), and west of buoy 30:			
Direct	3	N. ½ E	.7
Reverse	*183*	*S. ½ W*	*.7*
22. **Buoy 30** abeam. Bring Eagle Island Light (F. W.) astern on this course and, after coming abeam of the wharves, pass from 50 to 100 yards west of them:			
Direct	18	N. by E. ⅞ E	1.3
Reverse	*198*	*S. by W. ⅞ W*	*1.3*
23. **Wharves at Wilmington.**			

WILMINGTON

Wilmington, the chief port of the State of North Carolina, population 32,270 in 1930, is on the east bank of the Cape Fear River, 27 miles above its mouth. It has considerable trade in lumber, cotton, naval stores, and fertilizers, and is a distributing point for gasoline and other supplies to the surrounding hinterland. Excellent hotel accommodations are available in the city. A Coast Guard cutter is stationed at Wilmington.

National quarantine.—The quarantine and boarding station is on the east side of the channel, about 1 mile above Southport.

Pilots for the bar and river maintain a lookout tower in Southport and will board a vessel within a radium of 8 miles from the entrance buoy. All vessels will be met by the pilot boat. The usual anchorage for vessels awaiting a pilot is 1 mile south by west from the entrance buoy. Vessels bound for the Cape Fear River and desiring a pilot should radio time of arrival off bar to Wilmington. The information will be telephoned to the pilot station at Southport. Vessels bound upriver are reported by telephone from the pilot station when passing Southport.

Pilotage.—All vessels, coastwise or foreign, over 60 gross tons, shall take a State-licensed pilot from sea to Southport, and from Southport to sea, and the rates of pilotage shall be the rates given in column below, designated "Sea to Southport, or vice versa"; the employment of pilots from Southport to Wilmington and from Wilmington to Southport is optional, but any vessel taking a pilot from Southport to Wilmington, or from Wilmington to Southport, shall employ only a State-licensed pilot, and the rates of pilotage shall be the rates given in column designated "Southport to Wilmington, or vice versa."

Every pilot, when he has brought any ship or vessel to anchor, is required to moor such ship or vessel, or to give proper directions for the mooring of the same, and for her safe riding at such mooring. He shall also make known to the captain of such vessel the law requiring lights on board.

It shall be the duty of every pilot to inform the masters of vessels of their duty to report to the harbor master after arrival at Wilmington.

All vessels crossing the bar, either in or out, shall be required to pay full pilotage to the pilot offering his services, whether such craft be in tow or otherwise, and any pilot neglecting or detaining a vessel under his charge unnecessarily shall suffer the severest penalty of the law. Any person without the authority of the board of commissioners attempting to pilot a vessel or charging for such services shall pay a penalty of double the pilotage fee.

Any vessel hoisting her colors for a pilot shall be compelled to pay the first pilot offering his services full pilotage, whether such pilot is employed or not.

Every master of a vessel who shall detain a pilot after the time appointed, so that he cannot proceed to sea, though wind and water should permit, shall pay such pilot $4 per day during the time of his actual detention; and if any vessel which shall be boarded by a pilot without or within any of the inlets shall, by violence of the weather or otherwise, be driven to sea, the master or owner of such vessel shall allow and pay the pilot $4 per day for every day he shall be on board besides the fee of pilotage.

All vessels at anchor or under way within the bar of Cape Fear River at night shall exhibit a light in some conspicuous place, at least 10 feet above the deck, so as to be seen by vessels or steamboats passing up or down the river, under a penalty of $100 for each and every neglect, and shall also be liable for all damages or the amount of injury sustained by any vessel or boat coming in contact, to be recovered for the benefit of the injured party. And it shall be the duty of the pilots to notify the master of each vessel coming over the bar of the existence of this order.

When any pilot properly equipped shall see any vessel on the coast having a signal for a pilot or shall hear a gun of distress fire off the coast and shall neglect or refuse to go to the assistance of such vessel, such pilot shall forfeit and pay $100, one half to the informer, the other half to the master, unless such pilot is actually in charge of another vessel.

Authority is vested in each commissioner to hear and determine all matters of dispute between pilots and masters of vessels, or between pilots themselves, respecting the pilotage of vessels, appeal in certain cases to be allowed.

Any pilot running a vessel ashore, by which means any injury or detention is sustained by such vesel, shall report the same without delay to the chairman of this board.

No vessel under 60 tons shall be compelled to take a pilot or pay pilotage unless a signal for a pilot shall be made.

No pilot shall leave a vessel on the river without the consent of the master, and when any detention shall occur by fault of the master of any vessel the pilot shall be entitled to $4 per day for every day so detained.

It shall be the duty of every pilot bringing a vessel into port as aforesaid, and before leaving her, to furnish or cause to be furnished to the master or commander of such vessel his name in writing. Penalty, $20 for every neglect of this regulation.

No division of pilotage is permitted by any pilot on any terms, except for service rendered by another pilot under the regulations of the board of commissioners, and no commission nor reduction of the rates, nor rebates of rates will be permitted under a penalty of $50 for each and every offense.

No pilot will be permitted to leave his station to go to a neighboring port for the purpose of piloting a vessel bound from that port for the Cape Fear River unless under peculiar circumstances, at the discretion of the chairman of this board. And every licensed pilot is expected and required to provide the means of boarding and leaving vessels at sea by pilot boats or cutters. Arrangements

with tugboats or fishing boats or any other means of approaching or leaving vessels at sea will not be permitted under penalty of the revocation of license at the discretion of the board.

Schedule of pilotage rates effective February 1, 1932

Draft, feet	Sea to Southport	Southport to Wilmington	Total	Draft, feet	Sea to Southport	Southport to Wilmington	Total
6 and under	$9.00	$6.00	$15.00	20½	$81.00	$44.00	$125.00
7	10.00	7.50	17.50	21	85.00	45.00	130.00
8	11.00	9.00	20.00	21½	90.00	45.00	135.00
9	13.00	9.50	22.50	22	92.50	47.50	140.00
10	15.00	10.00	25.00	22½	95.00	50.00	145.00
10½	17.00	10.50	27.50	23	100.00	50.00	150.00
11	19.00	11.00	30.00	23½	100.00	55.00	155.00
11½	21.00	14.00	35.00	24	105.00	55.00	160.00
12	23.00	17.00	40.00	24½	108.00	57.00	165.00
12½	25.00	20.00	45.00	25	110.00	60.00	170.00
13	30.00	20.00	50.00	25½	112.00	63.00	175.00
13½	35.00	20.00	55.00	26	115.00	65.00	180.00
14	39.00	21.00	60.00	26½	118.00	67.00	185.00
14½	43.00	22.00	65.00	27	121.00	69.00	190.00
15	45.00	25.00	70.00	27½	125.00	70.00	195.00
15½	47.00	28.00	75.00	28	128.00	72.00	200.00
16	50.00	30.00	80.00	28½	130.00	75.00	205.00
16½	54.00	31.00	85.00	29	133.00	77.00	210.00
17	57.00	33.00	90.00	29½	135.00	80.00	215.00
17½	61.00	34.00	95.00	30	138.00	82.00	220.00
18	65.00	35.00	100.00	30½	140.00	85.00	225.00
18½	67.00	38.00	105.00	31	143.00	87.00	230.00
19	70.00	40.00	110.00	31½	146.00	89.00	235.00
19½	73.00	42.00	115.00	32	150.00	90.00	240.00
20	76.00	44.00	120.00				

NOTE.—Above rates are less 40 percent for coastwise vessels.

Harbor regulations.—The harbor master at Wilmington has control of the berthing and anchorage of all vessels. The following regulations are extracts from chapter 104, Revised Laws of North Carolina, 1905.

The harbor master shall have power and is required to collect from all vessels arriving in the port of Wilmington the following fees and no others, to wit:

All vessels of 100 tons net register and over shall pay the harbor master of the port of Wilmington the following fee, according to tonnage, which will entitle the vessel to the harbor master's services, prescribed by the port and harbor regulations, without further charge, while the vessel remains in port:

Steamers or sail vessels—

100 tons and under 500 tons	$3
500 tons and under 800 tons	4
800 tons and under 1,000 tons	5
1,000 tons and under 1,500 tons	10
Steamers or sail vessels and barges, 1,500 tons and under 3,000 tons	15

It shall be the duty of the harbor master, in addition to such other duties as may be imposed on him from time to time, personally to see that all the regulations of this port looking to the safety and convenience of the vessels arriving, remaining in, and leaving the same, shall be properly observed and kept; to this end he is required from time to time, and as often as may be

necessary, to inspect the wharves, docks, and places of anchorage in this port, and observe the location of the vessels using the same.

The master or consignee of any vessel wishing to move shall give the harbor master sufficient notice to enable him to give her a clear berth. The harbor master must be the judge of the time required.

The harbor master may remove any vessel or vessels moored to the ends of the wharves, or on either side of a dock, or lying in any part of a dock, which may be necessary, in his opinion, to expedite and render more safe and convenient the entrance or departure of any other vessel or vessels hauling at the time in or out of the said dock.

The harbor master shall cut the fast or fasts of any vessel, or cause the same to be cut or cast loose, when the captain or person in charge of such vessel refuses or neglects to slack her fasts, and to remove his vessel for the proper accommodation of another vessel passing into or out of her berth; or who shall refuse to give up the inside berth, or to remove and moor his vessel in conformity with the foregoing regulations, or with the orders of the said harbor master.

Whenever the harbor master shall require the services of a tug to enforce an order for the removal of a vessel against the will of the master, the charge of the tug for such service may be guaranteed to be paid by the board; but it shall be the duty of the harbor master to collect the costs, fines, and fees for such removal from the offending vessel by warrant in the name of the board. The harbor master will see that due notice of this section is served on the masters of all vessels.

Vessels, when not engaged in loading or discharging cargo, shall give place to such vessels that are ready to receive or deliver freight. And if the captain or person in charge of any vessel refuse to move said vessel when notified by the owners or agents of the wharf at which she is lying, the harbor master shall order him to haul to some other berth, or into the stream; and should the captain or person in charge refuse to obey the orders of the harbor master, then the harbor master shall himself move the vessel at the owner's expense, by use of steam tug, if necessary, and shall be entitled to the usual fee, to be recovered from the owners of the offending vessel.

The harbor master shall determine also how far and in what instances it is the duty of masters and others having charge of ships and vessels to accommodate each other in their respective berths and situations.

All differences between the masters of vessels moored at the same wharf or in adjacent docks, and of vessels in the stream, with respect to the location and space occupied by their respective vessels, or the interfering with each other at their moorings, shall be referred to, adjusted, and settled by the harbor master upon proper representation thereof.

No vessel shall anchor in the river, or extend her fasts so as to interrupt the navigation of said river, or the passage of the ferryboats to and from the usual place of landing on either side of the river, under the penalty of $50 for each and every offense, after notice from the harbor master.

No vessel shall extend her hull, bowsprit, yards, rigging, or fasts so as to interrupt the passage into or out of the public docks, under the penalty of $5 for each and every hour said offense shall continue, after notice from the harbor master.

No master or commander of a vessel shall disobey or neglect such orders and directions as may be given by the harbor master, in times of gales of wind, relating to the safety of vessels in the harbor, under the penalty of $100 for each and every offense, to be paid by the master or commander of said vessel.

No vessel having on board grain, fish scrap, or articles evidently in a state of putrefaction or offensive shall haul to or lay at any wharf, but shall anchor in the middle of the river until the order of the board shall be known, under the penalty of $100 for each and every hour said offense shall continue after notice from the harbor master. Nor shall any vessel discharge offensive bilge water within the limits of the city of Wilmington, under a penalty of $50.

Should any hulk, raft, flat, or other obstructive substance become sunken, from any cause, in the river, the same shall be immediately removed, under a penalty of $5 for each and every day such nuisance shall remain, after notice from the harbor master, to be paid by the parties interested or concerned; and in case exertions are not immediately made for the removal aforesaid,

the commissioners may exercise their discretion of using other means of abating the nuisance, even to the confiscation or condemnation of such obstructions.

Any person encumbering private or public docks, or wharves, with logs, boats, dilapidated hulks, or other trash or nuisance, shall forfeit and pay a fine of $5, if not removed immediately upon notice from the harbor master, and $5 for every additional day the nuisance remains. And when the owner cannot conveniently be found, the harbor master shall take the most speedy method to clear the dock, or wharf. This order applies particularly to those who use the public docks for fastening or mooring row boats, launches, and the like, for more than three hours at a time, and to those who use the public docks for landing driftwood, etc.

Any person casting loose or adrift any flat, raft, or raft of turpentine, or any boat or vessel, without the consent of the harbor master, had and obtained, shall be punished by a fine of $10 for each and every offense. One-half of the said fine shall, when collected, be paid to the person or persons giving information to the harbor master.

Any master or other person having charge of any vessel, flat or raft, who shall refuse or neglect to obey the directions of the harbor master in any matters within his authority, or shall molest, resist, or oppose the harbor master in the execution of any of the duties of his office, such master or other person, having charge of any vessels, flat, or raft, or any person whatsoever, shall, upon conviction of every such offense, forfeit and pay a sum not exceeding $100.

Every vessel exceeding 25 tons register must always have on board a shipkeeper or person capable of taking care of her.

No vessel shall be graved at any wharf or in any of the docks where vessels load or discharge.

Every ship, vessel, or steamer lying in one of the docks or moored to a wharf should keep a light burning on board thereof, from dark until daylight; said light to be suspended conspicuously midships, 15 feet above the deck of the vessel. The master, owner, or other person having charge of any ship, vessel, or steamer, making default herein, may be liable to a penalty of $5 for every offense.

The harbor master is authorized and instructed by the board of commissioners of navigation and pilotage to enforce the rules, regulations, and orders, as revised and adopted by the board on the 1st day of May 1907.

Any vessel coming into Cape Fear River, which is water-logged or abandoned, with cargo on board shall notify the harbor master before docking in the port of Wilmington. Until receiving instructions as to docking in said port, such vessel may anchor off the present site of the Carolina shipyard before proceeding into said port.

All other vessels arriving, whether light or with cargo, shall anchor off Liberty shipyard in the anchorage basin, until receiving instructions from the harbor master as to docking.

Speed of vessels or other craft shall not exceed 5 miles per hour when passing through the harbor from Point Peter to the foot of Queen Street, and any vessel or boat which causes damage to other craft by suction or the swell from such vessel shall be responsible for any damage which may occur by reason thereof.

In the event of failure or refusal on the part of any master to pay the fees herein prescribed, the harbor master is authorized to go before any magistrate or justice of the peace and issue a warrant against said master for such failure or refusal.

No vessel using fuel oil is permitted to discharge such oil from its tanks or bilges into the waters of the harbor. If necessary to discharge such oil, they are required to discharge into a lighter, which lighter shall not be permitted to discharge same in the harbor limits. Breach of this rule is punishable by a fine of $25.

All ashes from the fireroom shall be placed on deck and protected so that same will not go in the river. Ash chutes shall be kept on deck instead of over the rail. Twenty-five dollars fine for dumping ashes in the river.

The harbor master, in his absence, shall have the right to appoint a deputy harbor master to act in his stead.

The harbor master's jurisdiction shall extend from the Cape Fear bar to a point 7 miles above Point Peter on both the northeast and northwest branches of the Cape Fear River.

The harbor master is not required to file aboard vessels on arrival a copy of these rules and regulations, but a delivery of same to the agent or broker of such vessel shall be deemed due notice in law to such vessels.

(The harbor regulations given above were prescribed by the Board of Commissioners of Navigation and Pilotage for the Cape Fear River and bars, on April 15, 1923.)

Dockage facilities.—There are 65 wharves of all classes at Wilmington, with a total frontage of about 5,500 feet. These wharves are mostly privately owned. Warehouse and bulk freight storage are available. There is no bonded warehouse. All of the facilities within the city limits are served by the belt line railway which parallels the water front, with private connections to the larger of the remaining piers and wharves. The depth of water alongside the Wilmington wharves is 25 to 30 feet (7.6 to 9.1 m).

Communications. — Railroad connection with the interior and coastal cities is by means of the Atlantic Coast Line and Seaboard Airline Railroads. There is regular coastwise steamship service. The service to foreign ports is irregular.

Supplies.—Provisions and ship chandler's stores can be had at Wilmington. There are bunker coal and bunker fuel oil facilities. Diesel oil is available. Fresh water can be obtained alongside all of the principal piers or from a water boat. The river water is generally of very good quality for boiler purposes, but there are

Wilmington, N. C., water front from west southwestward. Customhouse in foreground; deep-water wharves on left.

times during protracted droughts or high tides when it becomes brackish.

Repairs.—Ordinary repairs to the machinery of steamers can be made at Wilmington; there are two marine railways, the larger capable of hauling out vessels of about 1,000 tons registered. The draft that can be hauled out at high water is 9 feet (2.7 m) forward, and 18 feet (5.5 m) aft. There is a 500-ton floating drydock capable of accommodating vessels up to 150 feet in length.

Towboats can be had at Wilmington. There is **wreckage** and **salvage equipment** which will permit of limited operations.

Storm warnings are displayed at Wilmington and Southport.

Public Health Service.—There is a relief station at Wilmington. The nearest Public Health hospitals are at Norfolk, Va., and at Savannah, Ga.

Aviation fields.—Land planes make use of the municipally owned **Bluethenthal Field.** Seaplanes may land in the anchorage basin at the southern end of the harbor. The basin is approximately 3,000 feet long and 1,000 feet wide. Aviation gasoline, oil, and service are readily obtainable at Wilmington.

Freshets.—Low-water stages prevail in the rivers above Wilmington from 2 to 4 months during the summer, and freshets usually occur as often as once a month during the rest of the year, but with no regularity.

Tides.—See the tide tables for the Atlantic Ocean in which the tides are predicted for every day at Wilmington. Proceeding toward the mouth of the river, the tides are earlier than at Wilmington. The mean range at the entrance is about 4½ feet (1.3 m) and at Wilmington about 2½ feet (0.7 m).

Currents.—The tidal currents on the bar run with considerable velocity, and as a rule set nearly in the direction of the channels, but on the last of the flood and first of the ebb they tend more or less across the shoals. In the river their set is generally in the direction of the channel, and during freshets the ebb has great velocity, sometimes entirely overcoming the flood. Abreast of Southport the estimated velocity of the ebb at strength of spring tides is about 2½ knots. At ordinary times a strong flood is felt for a considerable distance above Wilmington, where it runs 5¼ hours to nearly 7 hours of ebb; going down the river from Wilmington the periods of flood and ebb become more nearly equal. On the bar slack water occurs about 1 hour after high and low water.

7. CAPE FEAR TO CHARLESTON ENTRANCE

CAPE FEAR TO WINYAH BAY

(Charts 1236, 1237, 428)

From Cape Fear the coast trends first in a northwesterly direction, then curves gradually westward and southward to the entrance of Winyah Bay. That part of the Atlantic Ocean bordering on this curved coast is known as **Long Bay.** The coast is 80 miles in length between Cape Fear and Georgetown Lighthouses and consists of a sand beach, with numerous small sand hills, separated from the heavily wooded mainland by small streams and marsh; from offshore the woods appear to extend to the water.

The coast is clear and 3 fathoms (7.3 m) can be taken as close as 1½ miles from the beach, except at Murrell Inlet, where a 16-foot (4.8 m) spot is found 2 miles offshore. Shallow-draft boats should not follow along too close to the beach on account of several pieces of old wreckage that have been reported outside of the ordinary line of breakers. The 10-fathom (18.3 m) curve is from 18 to 21 miles offshore, and inside of it the water shoals gradually as the shore is approached.

The section of the **Intracoastal Waterway** between Cape Fear River, N. C., and Winyah Bay, S. C., is now under construction. Upon completion, about April 1936, it will afford an inside passage with a controlling depth of 8 feet (2.4 m) at mean low water, and a bottom width of 75 feet, for a distance of 94.5 miles.

Passage is now possible in the completed section from Cape Fear River to Little River Inlet for vessels whose draft will permit crossing the bar at the inlet, thus shortening the outside run to *Winyah Bay Lighted Whistle Buoy 2 WB* to 48½ miles. The controlling depth across the bar was 4½ feet (1.4 m) in August 1935.

Lockwoods Folly Inlet is about 11 miles westward of Cape Fear River. There are no aids for entering and passage without local knowledge is not recommended, as the inlet is closed by breakers at practically all stages of the tide and wind. The controlling depth was 3 feet (0.9 m) at mean low water in November 1934. Two wrecks, both visible at low water, are located off the mouth of the inlet on the western edge of the channel. There is a high sand dune east of the inlet.

Lockwoods Folly River is navigable from the inlet to the **Intracoastal Waterway** and to **Supply** post office, a distance of 18 miles, where a bridge with a fixed span blocks navigation. The controlling depth of Lockwoods Folly River is 2 feet (0.6 m) at mean low water. The channel is narrow and bounded on either side by oyster bars that are covered at high tide.

The range of tide at Lockwoods Folly Inlet is about 4½ feet (1.4 m) and 2 feet (0.6 m) at Supply.

Mary Inlet is reported to be practically bare at low tide. It is not used by boatmen.

Shallotte Inlet is about 18½ miles westward of Cape Fear River. In November 1934 the controlling depth was 5 feet (1.5 m) across the bar. The channel, which is no longer buoyed, crosses the bar about ½ mile west of the entrance on a northerly course and then follows about 150 yards off the beach to the east side of the inlet. The inlet is only used by local fishermen. Strangers should have local information for crossing the bar.

Shallotte River is navigable to the **Intracoastal Waterway** and to the closed bridge at the town of **Shallotte**, a distance of about 8 miles from the inlet. The controlling depth to Shallotte is 3½ feet (1.0 m) at mean low water. The river is used by local fishermen.

The range of tide is about 4½ feet (1.3 m) near the inlet and 3 feet (0.9 m) at Shallotte.

Tubbs Inlet, 5 miles westward of Shallotte Inlet has been reported to be practically closed.

Little River Inlet, S. C., is about 27 miles westward of Cape Fear River, and the western terminus of the now open section of the **Intra-**

coastal Waterway between the Cape Fear River and Winyah Bay. Vessels using this section of the waterway are required to go outside from Little River Inlet to Winyah Bay entrance, a distance of 47 miles.

The approach to this inlet is marked by *Little River Inlet Lighted Bell Buoy 2 LR*. The entrance is distinguished by a prominent, high, white sand dune on **Waiter Island** on the west side of the inlet. The main channel is close westward of **Bird Island**. The channel across the bar changes in depth and position and is marked by buoys which are shifted frequently. There was a controlling depth of 4½ feet (1.4 m) at low water in August 1935. Entrance should only be attempted in favorable weather and with a rising tide. The mean range of tide is about 4.8 feet (1.5 m) at the inlet.

Little River.—The **Intracoastal Waterway** westward to Winyah Bay will follow the course of Little River and boats of 8-foot (2.4 m) draft can now go to the wharf at the lower end of **Little River**, a town about 3½ miles above the inlet. Gasoline and some supplies are available at the town. There is highway and telephone connection to Wilmington and Georgetown. The river and Intracoastal Waterway are well marked by beacons and lights. A branch making eastward is known as **Calabash Creek**.

Directions, Little River Inlet to Winyah Bay.—From a position about 100 yards south of *Little River Inlet Lighted Bell Buoy 2 LR* steer a 217½° true (SW. ½ S. mag.) course for a distance of 48½ miles to a position about 100 yards southeast of *Winyah Bay Lighted Whistle Buoy 2 WB*. Then be guided by the directions given for Winyah Bay.

Vessels of 6 feet (1.8 m) draft may enter Winyah Bay by the North Jetty Channel. From a position about 100 yards south of *Little River Inlet Lighted Bell Buoy 2 LR* steer a 220° true (SW. ¼ S. mag.) course for a distance of 50 miles to a position about 100 yards southeast of *North Jetty End Buoy 2 N*. Then be guided by the directions given on page 142.

Little River Inlet to Murrell Inlet.—The coast trends southwestward for a distance of about 31½ miles, sweeping in somewhat from a straight line joining the two points. For about 5 miles west from Little River Inlet the coast is backed by a strip of marsh lying between it and the woods on the mainland, and the same is true for about the same distance to the northward and eastward of Murrell Inlet. For the rest of the stretch the woods rise immediately back of the beach, which shows the usual stretch of sand, with many hills more or less conspicuous. In this stretch of coast there are many inlets, but none with sufficient water to make them of any commercial importance.

Myrtle Beach is a summer resort with railroad and auto bus communication located on the beach on the east side at the mouth of **Eight Mile, or Withers Swash**, nearly 20 miles west-southwestward of Little River Inlet and 31½ miles north-northeastward of Georgetown Lighthouse. There is a large hotel at Myrtle Beach, which with its tall central superstructure forms the most prominent landmark between Beaufort, N. C., and Winyah Bay.

An aeronautical light, lat. 33°43′44″ N., long. 78°50′06″ W., of 2,000,000 candlepower has been installed in the cupola of a hotel

at the north end of Myrtle Beach. The light is 156 feet (47 m) above the sea, and makes 2 revolutions per minute. The main beam is elevated 10° above the horizon.

Murrell Inlet communicates with **Main** and **Drunken Jack Creeks**, which drain a considerable extent of swamp lying between the coast and mainland. It has been reported that there is about 6 feet (1.8 m) at mean low water in the channel over the bar. The bar is shifting and the channel changing, and strangers must use care in entering. Inside the inlet, where the channel turns sharply to the starboard around a sand spit, the tide rips are very strong at full ebb or flood tides. Good water can be found up this channel for about 1¾ miles to a launch landing. There is a small settlement here called **Sunny Side.**

The inlet should not be entered without local knowledge.

North Inlet, about 7 miles northward of Georgetown Lighthouse, is connected by both **Town Creek** and **Jones Creek** with **Winyah Bay**; Jones Creek, the southerly thoroughfare, is easier to follow and is good for 6 feet (1.8 m) at high tide. There is little water, however, in Winyah Bay and navigation is restricted to boats of shallow draft.

Some fishermen use North Inlet, but strangers should not attempt to enter and make passage to Winyah Bay without local knowledge. There are two openings about one-half mile apart and the high sand dunes between them are the most prominent in this vicinity. The northern entrance is completely closed at low water. The southern entrance had a depth of about 5 feet (1.5 m) on the bar and is the only one used. Entrance is only made in a smooth sea and on a rising tide and the appearance of the water is the best guide, as there is a line of breakers close to the north side of the channel, from the bar to the mouth of the inlet. A boiler of a wreck shows on the north side of the entrance.

WINYAH BAY

(Chart 428)

Winyah Bay is the first harbor southward of Cape Fear River navigable for vessels of moderate draft. The opening is between **North** and **South Islands**, and is marked by Georgetown Lighthouse, near the southern end of North Island. The entrance is marked by *Winyah Bay Lighted Whistle Buoy 2 WB* about 3 miles seaward of the outer end of the south jetty. The channel into the mouth of the bay is maintained by jetties, extending eastward from the southern tip of North Island and from a point on South Island southwest of the former. In July 1935 the controlling depths in Winyah Bay were as follows: **Entrance Channel**, 18 feet (5.5 m); **Western Channel**, 15 feet (4.6 m); and 16½ feet (5.0 m) in the **Sampit River.** This last depth was available to the principal docks at **Georgetown.**

Western Channel is the only one under improvement and is marked on its southwest and west sides by lights which are 250 feet from the middle of the channel.

There is another channel through the middle of the bay and close to Marsh Islands that is extensively used by local craft. It is not marked, but the wreck of the *Harvest Moon* forms a good day mark for use in passing through this channel.

On the south side of the Western Channel the entrance to the **Intracoastal Waterway**, the mouth of the Estherville and Minim Creek Canal, is marked by Canal Entrance Light No. 2 (group flashing red).

Boats drawing about 6 feet (1.8 m) of water or less may enter Winyah Bay by the North Jetty Channel, as follows: Pass about 100 yards southeast of *North Jetty End Buoy 2 N* at the east end of the north jetty, and on about a 243° true (SW. by W. ¾ W. mag.) course, head for the South Jetty Channel rear range light. Hold this course until about 500 yards from the buoy and 250 yards south of the north jetty, to avoid a shoal area just south of this jetty. Haul to the westward and head for the Middle Ground Channel rear range light and hold this course until in the main ship channel.

Georgetown Lighthouse from southeastward.

The jettied entrance to Winyah Bay is dangerous of navigation for small craft except in favorable weather. Heavy tide rips prevail near the ends of the jetties, and in moderate to heavy weather very heavy seas are present. With the ebb tide, particularly with a north or northeast wind, there is a strong southerly set across the south jetty. The south jetty covers at about three-fourths tide.

Georgetown Lighthouse, lat. 33°13′21″ N., long. 79°11′07″ W., near the south end of North Island, east side of Winyah Bay, is a white tower and dwelling. The light is group-flashing white, every 15 seconds (flash 3 seconds, eclipse 2 seconds, flash 3 seconds, eclipse 7 seconds), 85 feet (25.9 m) above the water, and visible 15 miles. Storm warnings are displayed near the lighthouse.

Winyah Bay South Jetty Light is a black, pyramidal, skeleton tower on a mound at the end of the south jetty entrance of Winyah Bay. The light is flashing white (flash 0.5 second, eclipse 4.5 seconds), 30 feet (9.1 m) above the water, and visible 11 miles.

Waccamaw River rises at Lake Waccamaw, N. C., and flows southwest 142 miles into Winyah Bay, just above Georgetown. In June 1934 there was a controlling depth of 12 feet (3.7 m) to **Conway**. From Conway to **Red Bluff** a depth of 2¾ feet (0.8 m) obtained. Above Red Bluff, no work having been done for several years, the channel is obstructed by logs and snags and cannot be navigated safely. The **Intracoastal Waterway** northward from Winyah Bay, when completed, will follow the natural waters of the Waccamaw River to a point about 7 miles northwest of Murrell Inlet; thence through a land cut to a point in the headwaters of Little River.

Pee Dee River rises in the mountains of North Carolina and flows generally southeast for 435 miles into Winyah Bay just westward of Waccamaw River. Above the Uharie River, 233 miles from the mouth, it is called the **Yadkin**. In June 1934 a depth of 9 feet (2.7 m), by way of **Bull Creek**, obtained to a point 52 miles above the mouth and 3 feet (0.9 m) to **Jefferys Creek**. Above Jefferys Creek the river cannot be safely navigated because of many snags and sunken logs.

Black River empties from northward into Pee Dee River about 3½ miles above its mouth; it is navigable for river steamers for a distance of 44 miles. **Mingo Creek** empties into Black River, about 22 miles above its mouth; it has a low-water depth of about 8 feet (2.4 m) for a distance of 10 miles to **Hemmingway Bridge**, the head of navigation, but there are many sharp bends.

Sampit River is entered from Winyah Bay through a dredged channel 400 feet wide with a controlling depth of 16½ feet (5.0 m) in July 1935. The river entrance is protected on the eastern side by a timber and brush training wall 2,000 feet long. The outer end of the training wall is marked by Sampit River Jetty Light (flashing red). The Sampit River is entered on Sampit River Range (front light flashing red, rear light occulting white) located northwest of Hare Island. The depth in the river channel for a distance of 2½ miles above the dredged channel is 18 feet (5.5 m) and this is the depth abreast the city of **Georgetown**. The principal landing above Georgetown is **Sampit**, about 10 miles above the mouth of the river.

Pilots.—Pilotage for Winyah Bay is compulsory for certain vessels. There is no regular pilot boat, but pilots will come out upon signal.

Rates of pilotage—Georgetown, S. C., effective May 15, 1933

(Positively no rebating by pilots)

Draft (feet and under)	Amount	Draft (feet and under)	Amount	Draft (feet and under)	Amount
6	$16	12½	$48	17	$105
7	19	13	54	17½	110
8	22	13½	60	18	115
9	25	14	66	18½	120
10	28	14½	72	19	125
10½	32	15	80	19½	130
11	36	15½	90	20	135
11½	40	16	95		
12	44	16½	100		

Towboats are employed by sailing vessels and may be had from Georgetown by making the signal when outside the bar.

Anchorages.—Good anchorage can be found anywhere in the bay between Georgetown Lighthouse and South Island Light. There is a limited anchorage in the upper part of the bay off the mouth of Sampit River, and between Western Channel Lights No. 13 and No. 15. On account of the limited swinging room, only small craft anchor in the Sampit River abreast Georgetown.

Quarantine.—The quarantine boarding station, formerly maintained near Georgetown, has been discontinued. The old station on South Island has been abandoned.

Storm warnings are displayed at Georgetown and Georgetown Lighthouse. Notices regarding displaying and taking down storm signals are telephoned to Georgetown Lighthouse from Georgetown.

Tides.—The mean rise and fall is about 3½ feet (1.0 m). The tide at Georgetown Lighthouse occurs about 25 minutes later than at Charleston, while at Georgetown it occurs about 1 hour 35 minutes later.

Currents.—The tidal currents in Winyah Bay vary in velocity with the state of the rivers emptying into it, as well as with the stage of the tide. Their velocity is greatest between the jetties, where, at strength, it is 2 to 3 knots. The set is diagonally across the south jetty. During freshets in the rivers, also with westerly winds, the buoys between the jetties are nearly towed under at times on the ebb. Off South Island the average velocity is from 2 to 2½ knots, increasing somewhat with the springs. Between North and South Islands the set of the flood current is toward Mud Bay until past the north point of the latter, when the set is more westward. Northward of Frazier Point the flood sets into the channel eastward of Hare Island and also into Waccamaw River. In the western channel the current sets generally fair with the course to be steered.

Remarks and dangers.—There are no dangers eastward of the entrance. The dangers southward of the entrance are described with the coast from Winyah Bay to Charleston. The south jetty is covered at high water, with the exception of the three mounds on it, which are ⅝ mile apart. Winyah Bay South Jetty Light, on the mound at the end of the jetty, and Georgetown Lighthouse are described with the coast preceding. The **Middle Ground** is extending seaward, and its eastern end should be given a good berth when off the entrance.

DIRECTIONS, WINYAH BAY

Approaches, from eastward.—From a position about 1 mile south of Frying Pan Shoals Lightship make good a 258½° true (W. ¾ S. mag.) course for 78 miles to a position about 100 yards south of *Winyah Bay Lighted Whistle Buoy 2 WB.*

From a position about 200 yards northwest of *Cape Fear River Entrance Lighted Whistle Buoy 2 CF* make good a 233½° true (SW. ⅞ W. mag.) course for 65 miles to a position about 100 yards south of *Winyah Bay Lighted Whistle Buoy 2 WB.*

From southwestward.—From a position about 200 yards southeast of *Charleston Lighted Whistle Buoy C* make good a 60° true (NE. by E. ½ E. mag.) course for 37 miles to a position about ½ mile

southeast of *Hector Wreck Lighted Bell Buoy 4 CR* and 15 miles 96° true (E. ¾ S. mag.) of Cape Romain Lighthouse. Then steer 3° true (N. ½ E. mag.) for 7 miles; Winyah Bay South Jetty Light will then bear 324° true (NW. by N. mag.). Then steer 356° true (N. ⅛ W. mag.) for 5 miles to a position 100 yards south of *Winyah Bay Lighted Whistle Buoy 2 WB.*

Courses and distances, Winyah Bay, sea buoy to Georgetown

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G. green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverses course in *italics*)		Distance
	True	Magnetic	
1. **Winyah Bay Lighted Whistle Buoy 2 WB,** bearing N., dist. 100 yards. (This course leads onto the South Jetty Channel Range abeam of Entrance Bell Buoy 2 G).	°	*Points*	*Nautical miles*
Direct	263	W. ½ S	2. 0
Reverse	*83*	*E. ½ N*	*2. 0*
2. **Entrance Bell Buoy 2 G,** bearing N., dist. 100 yards. Steer South Jetty Channel Range ahead (front light Fl. W., rear light Occ. W. red sector); pass 200 yards north of Winyah Bay South Jetty Lt. and 200 yards south of buoys 2 and 4:			
Direct	270	W. ⅛ N	1. 2
Reverse	*90*	*E. ⅛ S*	*1. 2*
3. **Middle Mound on South Breakwater,** bearing S., dist. 200 yards. Steer Middle Ground Channel Range ahead (front light Fl. W., rear light Occ. W.); pass 100 yards south of buoys 6 and 8:			
Direct	285	WNW. ½ W	1. 1
Reverse	*105*	*ESE. ½ E*	*1. 1*
4. **Buoy No. 8,** bearing N., dist. 100 yards; pass 300 yards northeast of Main Channel Range Front light and continue on course until Middle Ground Channel Range rear light bears 239° true (SW. by W. ⅜ W. mag.) (on south edge of red sector):			
Direct	303	NW. ⅞ W	.6
Reverse	*123*	*SE. ⅞ E*	*.6*
5. **Buoy No. 10,** bearing NE. by E. dist. 250 yards. Steer Main Channel Range astern (front light Fl. W., rear light Occ. W.); pass 100 yards east of buoys and about 300 yards west of the shore of North Island. When ¾ mile past Georgetown Lighthouse, this course leads near an 18-foot (5.5 m) spot. At this point there is deeper water 150 yards east of the range:			
Direct	337½	N. by W. ⅞ W	2. 1
Reverse	*157⅞*	*S. by E. ⅞ E*	*2. 1*
6. **Georgetown Light** (Gp. Fl. W.), bearing SE. ¾ S., dist. 1 mile:			
Direct	322	NW. ¾ N	.9
Reverse	*142*	*SE. ¾ S*	*.9*

Courses and distances, Winyah Bay, sea buoy to Georgetown—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse directions read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
7. **South Island Light** (Fl. W.), bearing W. ⅛ S., dist. 0.3 mile; pass 250 yards north of South Island Lt. (Fl. W.), 100 yards south of buoy 4, and 250 feet north of Western Channel Lt. No. 1 (Fl. W.):			
NOTE.—In Western Channel, from Lt. No. 1 to Lt. No. 15, the axis of the channel is 250 feet north and east of the lights.			
	°	*Points*	*Nautical miles*
Direct	288	WNW. ¼ W	2.3
Reverse	*108*	*ESE. ¼ E*	*2.3*
8. **Western Channel Light No. 3** (Fl. W.) abeam; pass 250 yards northeast of Canal Entrance Lt. No. 2 (Estherville and Minim Creek Canal) (Intracoastal Waterway entrance):			
Direct	297	NW. by W. ⅜ W.	.5
Reverse	*117*	*SE. by E. ⅜ E*	*.5*
9. **Western Channel Light No. 5** (Fl. W.) abeam:			
Direct	305	NW. ¾ W	.6
Reverse	*125*	*SE. ¾ E*	*.6*
10. **Western Channel Light No. 7** (Fl. W.) abeam:			
Direct	320	NW. ⅝ N	.6
Reverse	*140*	*SE. ⅝ S*	*.6*
11. **Western Channel Light No. 9** (Fl. W.) abeam:			
Direct	338	N. by W. ¾ W	.5
Reverse	*158*	*S. by E. ¾ E*	*.5*
12. **Western Channel Light No. 11** (Fl. W.) abeam:			
Direct	354	N. ⅜ W	.85
Reverse	*174*	*S. ⅜ E*	*.85*
13. **Western Channel Light No. 13** (Fl. W.) abeam:			
Direct	357½	N	1.1
Reverse	*177½*	*S*	*1.1*
14. **Western Channel Light No. 15** (Fl. W.), bearing W., dist. 200 yards:			
Direct	9½	N. by E	1.0
Reverse	*189½*	*S. by W*	*1.0*
15. **Rabbit Island Light No. 2** (Fl. R.) bearing E., dist. 150 yards. Continue this course until on Sampit River Range, passing 200 yards east of buoy 5:			
Direct	27	N.N.E. ⅝ E	.75
Reverse	*207*	*S. S. W. ⅝ W*	*.75*
16. **Buoy No. 5,** bearing W., dist. 200 yards. Steer Sampit River Range (front light Fl. R., rear light Occ. W.); pass 150 yards west of Sampit River Jetty Lt. (Fl. R.) and the jetty at the junction of the Peedee and Sampit Rivers. When inside the Sampit River, favor the eastern bank along the docks at Georgetown:			
Direct	------	Various	1.3
Reverse	------	*Various*	*1.3*
17. **Georgetown Harbor.**			

GEORGETOWN

Georgetown, S. C., population 5,082 in 1930, is situated on the north bank of the Sampit River, just inside its mouth; it has considerable trade in lumber, naval stores, and cotton. It is the terminus of a branch of the Seaboard Air Line Railway. The river trade to the Santee, Waccamaw, and Peedee Rivers is considerable. There is sufficient depth at the wharves for vessels able to enter the bay, and there are convenient, sheltered berths for small craft.

Supplies.—Provisions, gasoline, and fresh water in quantity and a limited amount of ship-chandler's stores and coal can be obtained at Georgetown.

Repairs.—Facilities for making repairs at Georgetown are limited; there are small machine shops and one marine railway of about 100 tons capacity for hauling out boats of 4-foot (1.2 m) draft forward and 7-foot (2.1 m) aft. There is a marine railway at Waverly Mills, on the Waccamaw River, 12 miles from Georgetown—length, 90 feet; draft, 6.5 feet (1.9 m) at high water.

United States Public Health Service.—The nearest marine hospital is at Savannah, Ga. At Georgetown there is a relief station (third class) of the United States Public Health Service.

WINYAH BAY TO CHARLESTON ENTRANCE

(Charts 1238, 1239)

Between Winyah Bay and Charleston Harbor an inside passage is afforded by the **Intracoastal Waterway**. Dredging of this section of the waterway to a depth of 10 feet (3.0 m) is now in progress (April 1935). In September 1935 it was reported that navigation at mean low water was restricted to a draft of 3½ feet (1.1 m) at one point and 5½ feet (1.7 m) through several reaches between Minim Creek and Charleston. Shoaling had reduced the depth at mean low water in the northerly section of the Estherville and Minim Creek Canal to 7.8 feet (2.4 m).

Along the coast there are a number of rivers and inlets into which depths of from 1 foot to 6 feet (0.3 to 1.8 m) can be carried from sea at low water. These inlets are changeable in character, and, although recent surveys have been made, the chart may not show present conditions. Suitable anchorages can be found inside these inlets or in the waters tributary to them. The channel at most of these entrances trends in a general northerly direction, and shoals and breakers pretty well mark the edges of the channels inside of the bars. The entrances to the **North Santee River** and **Bull Bay** are less difficult of navigation than the other entrances in this locality. Except in an emergency, however, none of the entrances should be attempted without favorable conditions and local knowledge.

Santee River is one of the largest rivers of South Carolina and empties into the ocean between Winyah Bay and Cape Romain. There are two mouths, known respectively as North Santee and South Santee; both are obstructed by shifting bars, with little depth, as shown on the chart. The Santee River is formed by the junction of the **Wateree** and **Congaree Rivers**, 124 miles above its mouth, and is navigable throughout. Wateree River is navigable 58 miles to the town of **Camden** and Congaree River 44 miles to the town of

Columbia. The rivers are under improvement by the removal of snags and shoals to maintain a depth of 4 feet (1.2 m) at low water to these towns. Boats enter the river from Winyah Bay through the **Intracoastal Waterway.**

The entrance to **South Santee River** is shoal and should not be attempted without local knowledge. There was a depth of 4 feet (1.2 m) over the bar in a narrow channel according to surveys made in January 1935.

There was a depth of 5 feet (1.5 m) over the bar at the entrance to the **North Santee River** according to surveys made in January 1935. The bar can be crossed on a 0° true (N. ⅛ E. mag.) course heading for the middle of the inlet.

East Bank, with 10 feet (3.0) over it, is the southeasterly end of the shoals, which extend 4 miles from shore southward of the entrance of Winyah Bay. The southeasterly end of the bank is marked by *East Bank Buoy* (red and black horizontally banded can), which lies nearly 2 miles 171° true (S. ⅝ E. mag.) of Winyah Bay South Jetty Light.

Between East Bank and Cape Romain, shoals extend 2 to 3 miles from shore; spots with 15 feet (4.5 m) over them extend 5¾ miles from shore in one place, the outer one lying 5¾ miles southward of Winyah Bay South Jetty Light. Farther out is broken ground with 5 fathoms (9.1 m) and less, which extends 12¾ miles from shore.

The wreck of the *Hector* lies on the outer edge of the shoals, 14 miles 94° true (E. ½ S. mag.) from Cape Romain Lighthouse. A red and black nun buoy is moored 100 yards east of the wreck. *Hector Wreck Lighted Bell Buoy 4 CR* is moored ¾ mile seaward from the wreck and 14.5 miles 94½° true (E. ½ S. mag.) from Cape Romain Lighthouse. Another wreck was formerly located 1¾ miles north or the *Hector*, but it is reported to have disappeared. The broken ground inside of the lighted bell buoy should be avoided by all deep-draft vessels.

Cape Romain Shoal extends nearly 4 miles southeastward from Cape Romain and is marked by *Cape Romain Shoal Buoy* (red and black horizontally banded can) in 33 feet (10.1 m) of water about ¼ mile outside of the shoal. There is a depth of 4¾ fathoms (8.6 m) 2¼ miles south-southeastward of the buoy, while the 6-fathom (11.0 m) curve is 3 miles southward.

Cape Romain Lighthouse, lat. 33°01′08″ N., long. 79°22′26″ W., on the east end of Raccoon Key, is an octagonal pyramidal tower; lower half white, upper half faces alternately black and white; black top. The light is group-flashing white, 3 flashes every 30 seconds (3 flashes 0.6 second each, 2 eclipses 6.9 seconds each, 1 eclipse 14.4 seconds), 154 feet (47 m) above the water, and visible 19 miles.

Cape Romain Harbor is an unimportant harbor having a general depth of from 1 to 2 feet (0.3 to 0.6 m). A narrow, crooked, unmarked channel with a limiting depth of 5 feet (1.5 m) leads through it from the sea around the north end of **Cape Island** to **Horse Head Creek.** This channel is extremely difficult to follow and should not be attempted by anyone unfamiliar with the locality. Into **Casino Creek,** which joins the **Intracoastal Waterway,** about 3 feet (0.9 m) can be carried. The harbor is used only by small local fishing

boats. A stranger seeking anchorage should go to Winyah Bay or Bull Bay. The mean rise and fall of the tide is about 5 feet (1.5 m). The inlet leading to Cape Romain Harbor from the south is practically closed at low water.

Bull Bay is broad and shallow with numerous shoals, many of which are bare at high water. There is a narrow channel, which is occasionally used as an anchorage, on its southwest side, having a depth of about 10 feet (3.0 m) at low water over the bar. The anchorage is easily accessible in moderately calm weather.

A shoal, the eastern end of which bares at low water, extends 0.6 mile off the point. It is close to the channel, but is marked on its extreme east end by a black can buoy, and breakers will show over the

Cape Romain Lighthouse and former lighthouse tower from northeastward.

shoal at any time that it is covered. To enter, leave this buoy and head about 300 yards off the point of **Bull Island**, being guided by the lead and the appearance of the shoal. Anchor in the channel when well sheltered from the sea, off **Jack Creek**. Small boats can go up **Bull Creek** into **Summer House Creek** opposite the Bull Island wharf.

Romain River is closed from the sea at both inlets at all stages of the tide.

Five Fathom Creek, at the western end of **Raccoon Key**, has a controlling depth of 6 feet (1.8 m) from the sea to the Intracoastal Waterway. The Creek, crooked and narrow at the upper end, enters the sea through an inlet marked by a buoy and two beacons. Strangers are not advised to attempt an entrance as the outer bar is subject to change.

Bull Breakers extend 4¼ miles southward from the shore on the southwest side of the entrance of Bull Bay and are marked off the southeasterly end by *Bull Breakers Buoy* (red and black hori-

zontally banded nun) which lies in 33 feet (10.1 m) 5½ miles, 166° true (S. by E. ⅛ E. mag.) from the eastern end of **Bull Island.**

Price Inlet, 5½ miles westward of Bull Bay, has an entrance depth of 6 feet (1.8 m) over the bar. The channel is unmarked. It is the best inlet between Bull Bay and Charleston and is used by local fisherman. Under average weather conditions there are heavy breakers on the shoal point on the eastern side of the channel and small breakers on the west side of the channel. A good anchorage may be made in Price Creek, and the Intracoastal Waterway may be reached at the head of the creek.

Capers Inlet, between **Capers Island** and **Dewees Island,** has an entrance depth of 4 feet (1.2 m) over the bar. It has a narrow, unmarked channel. It is little used but may be entered when the wind is southwest because of a shoal point that extends eastward on the south side of the inlet and breaks the southwesterly seas. There is a shoal, bare at about half tide, that extends southward along the eastern side of the inlet. There are numerous stumps and snags outside the high-water line in Capers Creek.

Dewees Inlet, between **Dewees Island** and **Isle of Palms,** has an entrance depth of 4 feet (1.2 m) over the bar. It has a narrow, unmarked channel and is of little use. Under average conditions, seas break entirely across the inlet.

Isle of Palms is a pleasure resort about 4 miles eastward of the entrance of Charleston Harbor. There is a prominent standpipe here. There is communication by autobus line with Mt. Pleasant and Charleston.

Breach Inlet has very little water on the bar and under almost all weather conditions is entirely surrounded by heavy breakers. Currents are extremely strong in this inlet. Boat traffic is obstructed by a fixed highway bridge over the inlet.

Rattlesnake Shoal lies a little over 3 miles from shore southeastward of Isle of Palms, and east-northeastward of the entrance between the jetties of Charleston Harbor. It is about 2 miles long east and west, has a least depth of 9 feet (2.7 m), and is marked by *Rattlesnake Shoal Buoy 2* (red nun) at its eastern end.

Charleston Lighted Whistle Buoy C, lat. 32°41′ N., long. 79°52′ W., is moored in 42 feet (12.8 m) of water off the entrance to Charleston Harbor, on Fort Sumter Range line. The buoy is black and white vertically striped; the light quick flashing white (75 flashes per minute), 16 feet (4.9 m) above the water, visible 9 miles. There is a whistle on the buoy.

Charleston (Fort Sumter) Radiobeacon, lat. 32°45′12″ N., long. 79°52′30″ W., is located at Fort Sumter.

Charleston Lighthouse, lat. 32°41′43″ N., long. 79°53′02″ W., on the south end of Morris Island, is 4 miles southwestward of the entrance of Charleston Harbor. The structure is a black and white, horizontally banded conical tower, black at top. The light is group flashing white every 30 seconds (4 flashes 3 seconds, 3 eclipses 1 second each, 1 eclipse 15 seconds), 155 feet (47 m) above the water, and visible 19 miles.

There is a **Radio Direction-Finder** station located on the northeast end of Folly Island and about 1 mile south of Charleston Lighthouse, call letters NZV.

8. CHARLESTON

CHARLESTON HARBOR

(Charts 470, 680, and 681)

Charleston Harbor is 264 miles southwestward of Cape Hatteras and about 65 miles northeastward of Savannah entrance. The harbor is the approach to the city of Charleston and to Cooper and Ashley Rivers; it is easy of access either day or night in clear weather and is one of the best harbors of refuge on the south Atlantic coast. The port has a large foreign and coastwise trade, the principal articles of commerce being coal, cotton and cotton goods, lumber, petroleum products, and fertilizer material.

The entrance is between two converging jetties which extend nearly 3 miles seaward across the bar. In June 1934, there was a controlling depth of 30 feet (9.1 m) along the Fort Sumter Range (mid-channel), seaward of the jetties. The shoal along the northern edge of the channel near buoy 2 was being removed. The controlling depth in the channel between the jetties was 30 feet (9.1 m). The channel is marked by *Charleston Lighted Whistle Buoy C*, range lights, and buoys.

Prominent features.—Eastward of the entrance, on the Isle of Palms, is a tank which shows prominently from seaward. On the southern side of the entrance is Charleston Lighthouse. *Charleston Lighted Whistle Buoy C* is moored in 42 feet (12.8 m) of water off the entrance to the harbor, on Fort Sumter Range line. On the eastern side of the entrance is the village of **Moultrieville**, and **Fort Sumter** is on the west side of the channel inside the entrance. The spires and houses of the city of Charleston will be seen from outside the bar when the entrance is fairly opened out.

Cooper River enters Charleston Harbor from the northward, through Drum Island Channel, and on the eastern side of the city of Charleston. The channel westward of Drum Island through **Town Creek** (controlling depth 30 feet (9.1 m), 1934) is marked by lights and is used by vessels going alongside piers westward of the island. Cooper River, Drum Island, and Town Creek are spanned by a fixed cantilever bridge. The overhead clearance is 135 feet above mean high water for Town Creek, and 150 feet for Cooper River. A channel of 30 feet (9.1 m) draft in the Cooper River is maintained to the navy yard, which is on the west bank about 5 miles above the customhouse in the city. In January 1934, however, there was a depth of 27 feet (8.2 m) in the channel north of Drum Island southward of the range. Deep water extends to the port terminal 2 miles above the navy yard.

This portion of the Cooper River is marked by range lights, beacons, and buoys, and is used extensively by large vessels. **North Charleston** is a suburb of Charleston, lying between the navy yard and port terminal. It is the site of several oil wharves, asbestos and phosphate plants, and a cotton compress. The Cooper River above the port terminal is marked, and is good for a draft of 23 feet (7.0 m) for a distance of 17 miles to the **T** where the river forks; 16 feet (4.9 m) can be taken to the Seaboard Air Line Railroad drawbridge at **Rice Hope** on the Western Branch, 4 miles above the **T**; 7 feet

(2.1 m) to **Springfield Landing**; and 5 feet (1.5 m), about 14 miles above the **T** to **Wadboo Bridge**, the head of navigation.

A draft of 10 feet (3.0 m) can be taken up the Eastern Branch, about 6 miles above the **T**, to **Pompein Chapel**, and a draft of 6 feet (1.8 m) 2 miles farther to the North State Lumber Co. log landing at **Quimby Creek**, which has a depth of 6 feet (1.8 m) alongside the principal wharf. Launches can go about 4 miles farther. The channel in the East Branch is very narrow and follows the ebb tide bends.

Wando River empties from the northeast into Cooper River, eastward of Drum Island. **Cainhoy**, also known as **Wando**, is the only village on this river, and lies about 12 miles from the customhouse dock in Charleston. A draft of 12 feet (3.6 m) can be taken to the Cainhoy Wharf, which has 6 feet (1.8 m) alongside. Provisions and gasoline in very limited quantities can be obtained; no fresh water is piped to any of the wharves. There is a post office, and communication is maintained with Charleston by a launch making daily trips between the two places. The Tuxbury Lumber Co. has a log landing about 1 mile above Cainhoy. A draft of 12 feet (3.6 m) can be carried to their principal loading wharf, which has 10 feet (3.0 m) alongside. The Wando River continues for about 7 miles to Wards Bridge (fixed) at the head of navigation. **Guerin Creek** empties from the northeast into the Wando River about 2 miles above Cainhoy. Guerin Bridge (fixed), the head of navigation, lies about 3 miles from its mouth. The upper part of the Wando River is shown on chart 681.

Several small and unimportant creeks empty into Charleston Harbor. Of these, the most used is **The Cove**, which is the southern entrance to the **Intracoastal Waterway** northward to Bull Bay, Winyah Bay, and other points in that locality. The entrance is marked by Moultrieville Light No. 4 and a range off the northwest end of Fort Moultrie on Sullivans Island. The Hog Island Channel and Shem Creek with a controlling depth of 5 feet (1.5 m) lead to small docks at **Mount Pleasant** on the east side of Lower Bay. The entrance to the creek is marked by Shem Creek range light. Shem Creek is crossed by a fixed bridge about ¼ mile from the entrance.

Shipyard Creek empties into the Cooper River from the west side, about 1 mile above the north end of Drum Island. Considerable traffic in oil, phosphates, and lumber uses this waterway. In January 1935 there was a controlling depth of 22 feet in Shipyard Creek to a point about 250 yards above the bend northward abreast the Gulf Refining Company, thence 15½ feet to the head of the improvement at the Tuxbury Lumber Wharf. Shipyard Creek Light 5A is on the north point of the entrance to the creek.

Ashley River empties into Charleston Harbor from northwestward on the southwest side of Charleston. There are no towns or villages of importance; the principal landings are at numerous phosphate works, all of which have wharves extending to the channel.

In May 1933 the controlling depth was 19 feet (5.8 m) to **Standard Wharf**, the upper phosphate plant near Duck Island. Above Standard Wharf a least depth of about 7 feet (2.1 m) at low water or 13 feet (3.9 m) at high water can be taken a distance of about 8 miles to **Lambs**. Above Lambs there is a depth of 7 feet (2.1 m) in the chan-

nel for a distance of 5 miles and thence 3 feet (0.9 m) for a distance of 1½ miles to **Greggs**. **Bacons Bridge** (closed), which is usually considered the head of navigation, is 5½ miles above Greggs. The tides have a range of 5 to 6 feet (1.5 to 1.8 m) to Greggs.

Four drawbridges with openings 75 to 100 feet wide cross the river; the first is at Charleston, about 2 miles above the Battery; the second is the Seaboard Air Line Railway bridge, about 3 miles above the Battery; the third is the Atlantic Coast Line Railroad bridge at **Bees Ferry**; and the fourth is at **Magnolia Garden**, 1 mile below Lambs. The bridge at Bees Ferry requires caution when passing up the river on the ebb current, which sets across the end of the draw; vessels can pass on either side of the draw pier.

Wappoo Creek, on the west side of Ashley River 1¼ miles above the Battery, is the entrance to the **Intracoastal Waterway** southward. The entrance is marked by Wappoo Cut Light No. 1 on the point of shoal on the south side of the entrance and Wappoo Cut Range beacons. The controlling depth at the entrance was 7 feet (2.1 m) in June 1934.

DIRECTIONS, CHARLESTON HARBOR

From northward.—The safer course, and the one generally used by large, deep-draft vessels, is to pass outside of **Frying-Pan Shoals Lightship**.

From a position about 1 mile south of *Cape Lookout Shoals Lighted Whistle Buoy* a course of 229° true (SW. ¾ W. mag.) made good will lead to a position about 1 mile south of Frying-Pan Shoals Lightship.

From a position about 1 mile south of Frying-Pan Shoals Lightship make good a 244° true (SW. by W. ⅞ W. mag.) course for 90 miles, passing about 2¾ miles south-southeast of *Cape Romain Lighted Whistle Buoy 2 CR*. This course should lead in a least depth of about 12 fathoms (21.9 m) to a position with Cape Romain Lighthouse bearing 326° true (NW. by N. mag.), distant 17¼ miles. The only danger is the broken ground extending off between Winyah Bay and Cape Romain, on which there is a depth of 3¾ fathoms (6.8 m) near the wreck lying 11 miles from shore, which is marked by *Hector Wreck Lighted Bell Buoy 4 CR*.

From this position a 255° true (WSW. ⅞ W. mag.) course made good for 25 miles should lead to a position 2 miles east-southeastward of *Charleston Lighted Whistle Buoy C*. If uncertain of the position keep in a depth of over 8 fathoms (14.6 m) until the buoy is sighted. The dangers between Winyah Bay and Charleston are described with the section of the coast preceding.

From southward.—From a position about 2 miles southeastward of Savannah Lightship make good a course of 47½° true (NE. ¼ E. mag.) for 65½ miles, passing about 2 miles southeastward of *Hunting Island Lighted Whistle Buoy 6 HI*, to a position about 2 miles southeastward of *Charleston Lighted Whistle Buoy C*.

Caution.—Along the coast from Charleston to Jacksonville the courses between lightships and sea buoys are comparatively close inshore, and vessels must guard against an inshore set, which may amount to a knot or more, due to indraft of current into the various inlets.

In this section, preceding a northeasterly or following a southerly gale, an atmospheric condition known as "southern haze" may be encountered, resulting in low visibility of lights even in fine weather when it is clear overhead. During the periods when this condition exists it is reported that excessive inshore sets have been experienced.

Courses and distances, Sea Buoy to Charleston

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G. green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Charleston Lighted Whistle Buoy C** (Quick Fl. W.) bearing N., dist. 150 yards. Steer Fort Sumter Range (front light Fl. W., rear light F. G.) ahead; pass 200 yards northeast of Charleston Lighted Bell Buoy 1 (Fl. W.) and midway between the buoys marking the dredged channel:			
Direct	299	NW. by W. ⅜ W	7.6
Reverse	*119*	*SE. by E. ⅜ E*	*7.6*
2. **Turn Lighted Bell Buoy 10** (Fl. R.) abeam, dist. 200 yards. Steer Mount Pleasant Range (front light Fl. R., rear light Occ. R.) ahead; pass 150 yards northeast of buoy 17, and 300 yards northeast of bell buoy 19:			
Direct	317	NW. ¼ N	1.4
Reverse	*137*	*SE. ¼ S*	*1.4*
3. **Sumter Shoal Lighted Bell Buoy 19A** (Fl. W.), bearing W., dist. 300 yards; pass about 150 yards northeast of lighted bell buoy 19A:			
Direct	295	NW. by W. ¾ W	.3
Reverse	*115*	*SE. by E. ¾ E*	*.3*
4. **Sumter Shoal Lighted Bell Buoy 19A** (Fl. W.), bearing SE., dist. 400 yards. Steer South Channel Range (front light Fl. G., rear light Occ. G.) ahead; same range covered by two daymarks astern (slatted beacon in line with Fort Moultrie tank). Pass 200 yards north of buoy 21, 250 yards south of lighted bell buoy 10A, and 250 yards north of the quarantine buoys:			
Direct	270	W. ⅛ N	2.0
Reverse	*90*	*E. ⅛ S*	*2.0*
5. **Upper Middle Ground Lighted Bell Buoy 12** (Fl. R.) bearing N., dist. 175 yards:			
Direct	307	NW. ⅝ W	.5
Reverse	*127*	*SE. ⅝ E*	*.5*
6. **Potts Shoal Lighted Gong Buoy 14** (Fl. R.), bearing N., dist. 300 yards; pass 70 yards west of lighted gong buoy 14:			
Direct	344	N. by W. ⅜ W	.5
Reverse	*164*	*S. by E. ⅜ E*	*.5*
7. **Castle Pinckney Lighted Buoy 16** (Fl. R.), bearing E., dist. 300 yards; pass 200 yards west of buoy 18:			
Direct	1	N. ⅛ E	.7
Reverse	*181*	*S. ⅛ W*	*.7*

Courses and distances, Sea Buoy to Charleston—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
8. **Shutes Folly Island Spit Light 3** (Fl. R.), bearing E., dist. 400 yards. Pass under fixed span, 150 feet (45.7 m) above mean high water:	°	*Points*	*Nautical miles*
Direct	10	N. by E.	1.7
Reverse	*190*	*S. by W.*	*1.7*
9. **Drum Island Channel Range Front Light,** bearing E., dist. 500 yards. Haul westward to Drum Island Channel Range:			
Direct		Various	.1
Reverse		*Various*	*.1*
10. **On Drum Island Channel Range.** Steer Drum Island Channel Range (front light Fl. W., rear light Occ. W.) astern, pass midway between lighted buoy 23 and buoy 22, 100 yards north of buoy 25, and 200 yards north of Drum Island North Spit Lt. No. 8:			
Direct	299	NW. by W. ⅜ W.	.8
Reverse	*119*	*SE. by E. ⅜ E.*	*.8*
11. **Drum Island North Spit Light 8** (Fl. R.), bearing SE. by S., dist. 400 yards. Steer Cooper River Lower Range (front light Fl. W., rear light Occ. W.) ahead; pass 50 yards west of buoy 26, 150 yards west of Daniels Island Shoal Lt. No. 10, and 150 yards east of lighted buoy 27. Continue on course until 500 yards south of Cooper River Lower Range Front Light, with Marsh Point Lt. No. 9 (Fl. G.) in range with Upper Marsh Front Lt. No. 11 (Fl. W.):			
Direct	0	N. ⅛ E.	1.6
Reverse	*180*	*S. ⅛ W.*	*1.6*
12. **Cooper River Lower Range Front Light,** bearing N. ⅛ E. dist. 500 yards. Come onto Cooper River Upper Range:			
Direct	314	N. W.	.4
Reverse	*134*	*S. E.*	*.4*
13. **Marsh Point Light 9** (Fl. G.), bearing S., 400 yards. Steer Cooper River Upper Range (front light Fl. W., rear light Occ. W.) astern. Pass 175 yards south of buoy 28 and 175 yards north of Upper Marsh Front Lt. No. 11 (Fl. W.):			
Direct	278	W. ⅞ N.	.7
Reverse	*98*	*E. ⅞ S.*	*.7*
14. **Upper Marsh Front Light 11** (Fl. W.), bearing SE. ¼ S., dist. 250 yards. Steer Navy Yard Channel Range (front light 11 Fl. W., rear light 7 Occ. W.) astern:			
Direct	317	NW. ¼ N.	.9
Reverse	*137*	*SE. ¼ S.*	*.9*

Courses and distances, Sea Buoy to Charleston—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
15. **North Radio Tower**, bearing SW., dist. 275 yards:			
Direct	341	N. by W. ⅝ W	0.7
Reverse	*161*	*S. by E. ⅝ E*	*.7*
16. **East Side Shoal Buoy 32**, bearing E., dist. 50 yards. Pass 150 yards from west bank:			
Direct		Various	1.7
Reverse		*Various*	*1.7*
17. **Charleston Port terminal.**			

PORT OF CHARLESTON

Charleston, the largest city and port in the State of South Carolina, is situated at the confluence of the Cooper and Ashley Rivers at the head of the largest natural deep-water harbor on the Atlantic coast south of Hampton Roads. The distance from the ends of the jetties to the city wharves is between 7 and 8 miles. It had a population of 62,265 in 1930. The city is located in the center of a rich agricultural district which it serves as a distributing point for all classes of supplies. Numerous manufacturing plants are located in or near Charleston. Coal, cotton, lumber, fertilizer, and petroleum products are shipped. The principal wharves are on the eastern water front of the city extending along the west bank of the Cooper River. The climate is equable and the port is comparatively free from fog and high winds.

Quarantine.—The quarantine anchorage is on the south side of South Channel abreast of Fort Johnson and is marked by two yellow buoys. Vessels subject to visitation by the health officer are boarded when off the quarantine anchorage.

Pilots will be found cruising outside the bar; the limit of their cruising ground is 25 miles from the entrance. Pilotage is compulsory for certain vessels. Vessels desiring a pilot and not having obtained one can anchor about 1 mile northwestward of *Charleston Lighted Whistle Buoy C* until boarded by one. Pilots for the **Intracoastal Waterway can be obtained in Charleston.**

Pilotage.—Every pilot, before leaving any vessel which he shall have brought into port, shall furnish the master or commander thereof with a copy of the port regulations, for which he shall take a receipt.

And it shall be the duty of every pilot bringing a vessel into this port as aforesaid, and before leaving her, to furnish or cause to be furnished to the master or commander of such vessel his name in writing and the name of the street, and number of his residence; and also the name and number of the pilot boat to which he is then attached. Penalty, $20 for every neglect of this regulation.

It shall be the duty of every pilot to inform the masters of vessels of their duty to report at the harbor master's office within 24 hours after their arrival at the city.

Pilotage is compulsory for all vessels, both domestic and foreign, engaged in foreign or domestic trade, except steam coasting vessels. All coasting vessels under 100 tons or drawing less than 6 feet are exempt.

Pilotage rates.—Rates for pilotage are as follows: The rate covers pilotage in one direction only. It includes, however, stop at quarantine for pratique. Vessels remaining off city front for orders or for other reasons before proceeding to wharf, or vessels bound to or from wharves on Ashley River or on Cooper River above the Southern Railway coal pier, will be charged rate for moves in addition to regular pilotage rate.

Vessels entering port in distress are charged pilotage on maximum draft one way only. Pilots carried off shall receive maintenance and accommodation of master, $4 per day of absence and expenses back to port. If vessel has laid 16 hours or more outside the bar, maintenance and expenses back to port shall be given.

Rates of pilotage for Charleston, S. C.

Draft (feet and under)	Cargo or empty	For bunker coal	Draft (feet and under)	Cargo or empty	For bunker coal
6	$14.00	----	20	100.00	60.00
7	16.50	----	20½	107.75	61.50
8	20.00	$12.00	21	115.50	63.00
8½	21.25	12.75	21½	118.25	64.50
9	22.50	13.50	22	121.00	66.00
9½	23.75	14.25	22½	123.75	67.50
10	30.00	20.00	23	126.50	69.00
10½	36.75	21.00	23½	129.25	70.50
11	38.50	22.00	24	132.00	72.00
11½	40.25	23.00	24½	134.75	73.50
12	42.00	24.00	25	139.50	75.00
12½	43.75	25.00	25½	146.75	76.50
13	50.00	32.50	26	154.00	78.00
13½	54.00	33.75	26½	159.00	79.50
14	56.00	35.00	27	162.00	81.00
14½	58.00	36.25	27½	165.00	82.50
15	60.00	37.50	28	168.00	84.00
15½	62.00	38.75	28½	171.00	85.50
16	68.00	48.00	29	174.00	87.00
16½	74.25	49.50	29½	177.00	88.50
17	76.50	51.00	30	180.00	90.00
17½	78.75	52.50	30½	183.00	91.50
18	81.00	54.00	31	186.00	93.00
18½	85.00	55.50	31½	189.00	94.50
19	90.00	57.00	32	192.00	----
19½	95.00	58.50			

Moves, etc.

From anchorage or city up Cooper River	$8
Down Cooper River to city or anchorage	8
From anchorage or city up Ashley River	8
Down Ashley River to anchorage or city	8
From city to quarantine or roads	4
From quarantine or roads to city	4
Docking when requested	4
Streaming when requested	4
Detention per day or fraction thereof	4
All barges and vessels under enrollment, in tow, under 6 feet	Free.
All barges and vessels under enrollment, in tow, 10 feet or under, no pilot	5

NOTE.—Vessels not taking a bar pilot pay double river pilotage.

Harbor Regulations.—The anchorage and berthing of vessels is under control and supervision of the **Harbor Master.** The following

are extracts of the "**Port Regulations**" as promulgated by the Board of Harbor Commissioners dated January 1928.

"All ships in passing up and down rivers along wharves, are required to reduce their speed and proceed at rate only which will assure safe steerage, thereby avoiding accident to ships discharging or loading cargo at wharves.

Oil refuse.—"A bill to prohibit the discharging of seepage and oil refuse from vessels while in the waters of this State.

"Be it enacted by the General Assembly of the State of South Carolina:

"SECTION 1. It shall be unlawful for any person or persons, their agents, servants or employees, in charge of or having custody of, any vessel entering or while within any harbor in this State, to discharge or permit to be discharged, from any vessel any seepage or refuse of fuel oil, or any other oil product.

"SEC. 2. Any violation of this act shall be a misdemeanor, and, upon conviction thereof, shall be subject to a fine not exceeding five hundred ($500) dollars, and if said fine is not paid, the same shall be deemed to be a lien on the vessel over which said person had control; said lien shall be a prior lien to all other liens except State taxes, and shall be enforceable as other liens are by the law of this State.

"SEC. 3. It shall be the duty of the port commissioners, or other officer or person in charge of, or having supervision over vessels entering the ports of this State, to see that the provisions of this act are enforced.

"SEC. 4. All acts and parts of acts inconsistent with this act are hereby repealed.

"SEC. 5. This act shall take effect immediately upon its approval by the Governor."

The harbor master.—1. It shall be the duty of the harbor master, in addition to such other duties as may be imposed on him from time to time, personally to see that all the regulations of this port looking to the safety and convenience of the vessels arriving, remaining, and leaving the same, shall be properly observed and kept; to this end he is required from time to time, and as often as may be necessary, to inspect the wharves, docks, and places of anchorage in this port, and observe the location of the vessels using the same.

2. His jurisdiction is concurrent over the harbor of Charleston and its tributaries within the radius of 5½ miles from southeast point of White Point Garden. He is required to keep the channel-way and track of steamers clear. It is his duty to berth vessels at appropriate wharves and in docks; and when called upon by the proprietor or occupant of any wharf or dock to change the berth of any vessel lying at such occupant's premises; it is made his duty to move such vessel to some other wharf, or to a safe anchorage in the stream. He is charged with the execution of any police regulations which may hereafter be adopted for the better government of the harbor.

3. The harbor master may remove any vessel or vessels moored to the ends of the wharves, or on either side of a dock, or lying in any part of a dock, which may be necessary, in his opinion, to expedite and render more safe and convenient the entrance or departure of any other vessel or vessels hauling at the time in or out of the said dock.

4. The harbor master shall cut the fast or fasts of any vessl, or cause the same to be cut or cast loose, when the captain or person in charge of such vessel refuses or neglects to slack her fasts, and to remove his vessel for the proper accommodations of another vessel passing into or out of her berth; or who shall refuse to give up the inside berth, or to remove and moor his vessel in conformity with the foregoing regulations, or with the orders of the said harbor master.

5. Whenever the harbor master shall require the services of a tug to enforce an order for the removal of a vessel against the will of the master, the charge of the tug for such service may be guaranteed to be paid by the board; but it shall be the duty of the harbor master to collect the costs, fines, and fees for such removal from the offending vessel by warrant in the name of the board. The harbor master will see that due notice of this section is served on the masters of all vessels.

6. Vessels when not engaged in loading or discharging cargo, shall give place to such vessels as are ready to receive or deliver freights. And if the captain or person in charge of any vessel refuse to move said vessel when notified by the owners or agents of the wharf at which she is lying, the harbor master shall order him to haul to some other berth, or into the stream, and should the

captain or person in charge refuse to obey the orders of the harbor master, then the harbor master shall himself move the vessel at the owner's expense by use of steam tug, if necessary, and shall be entitled to a fee of $5, to be recovered from the owners of the offending vessel.

7. The harbor master shall determine also how far and in what instances it is the duty of masters and others having charge of ships and vessels to accommodate each other in their respective berths and situations.

8. All differences between the masters of vessels moored at the same wharf or in adjacent docks, and of vessels in the stream, with respect to the location and space occupied by their respective vessels, or the interfering with each other at their moorings, shall be referred to, adjusted, and settled by the harbor master upon proper representation thereof.

General rules.—1. No wharf shall be run out, made, altered, enlarged, or extended beyond the prescribed limits. And no person shall make, alter, or extend any wharf without laying before the board of harbor commissioners a plan in duplicate of said wharf, and obtaining the written approval of the board to the same. One copy of the plan, when approved, shall be filed with the secretary of the board, and the other returned to the person presenting it. Before an application for permission to alter, extend, or enlarge any wharf is considered by the board of harbor commissioners, the owner or representative of said property shall give notice in the daily papers of Charleston one week previously that such application is to be made. The notice to appear at least twice.

2. Anyone offending against this section shall forfeit and pay the sum of twenty dollars for every such offence, and shall moreover be fined in the sum of twenty dollars for every day such wharf or obstruction shall remain.

3. Whenever it becomes necessary to use a conveyance or to incur any expense in visiting localities with a view to defining lines for the construction of wharves or other improvements, such expense shall be borne by the parties making applications for permits, for whose benefits the lines are to be defined.

4. The harbor master has full authority, and he is hereby required so to regulate the manner in which a vessel shall lie at any of the public wharves, that the facilities for discharging and receiving cargoes may be afforded as generally as may be practicable, and as will best promote the public interest. Any person having charge of any vessel who shall refuse or neglect to obey the harbor master in carrying out this section shall forfeit and pay a fine of $5 for each and every offence.

5. No vessel having gunpowder, dynamite, or nitroglycerine, or any other explosive substance on board shall approach any wharf nearer than 100 fathoms. Such vessels shall anchor out of the way of passing steamers, and shall keep a red flag flying in main rigging while receiving or discharging powder. The handling of powder, dynamite, nitroglycerine, or any other explosive substance to and from vessels in the harbor must be under the supervision of the harbor master, whose duty it is to see that every precaution against danger of ignition or explosion is adopted and rigidly observed.

6. Vessels must lie with their heads up the dock, and those in the first berth must haul far enough to bring their sterns past the end of the wharf, unless prevented from lying so by the form or situation of the wharf or dock, or by position of other vessels near them.

7. No vessel shall take or keep such a position in or near any dock as to prevent other vessels from getting in or out of the same.

8. No vessel shall take or keep a berth at any wharf, or in a dock, contrary to the harbor master's directions, he being vested with full power and authority to regulate and fix the berths of all vessels.

9. No ballast, stone, dirt, or rubbish shall be thrown from any vessel into the docks or stream. And every vessel landing or taking in ballast must use proper means to prevent any part of the same from falling into the dock. And all vessels landing ballast on a wharf must keep a clear passageway alongside the vessel, and so place the ballast as to prevent it sliding into the dock. The posts to which the vessels make fast must likewise be kept clear of ballast, or other obstructions.

10. Every vessel hauling past, or lying alongside and made fast to another vessel, shall put out in a proper manner, good and sufficient fenders, and keep the same so placed as to prevent injury to the vessel she shall be alongside of; and shall likewise so place and keep her moorings as to prevent injury to the said vessel. And if discharging or taking in a cargo athwart another

vessels' decks, she must also keep her plank or staging so fixed as not to cause injury.

11. That every ship, vessel, or steamer lying in one of the docks or moored to a wharf must keep a light burning on board thereof, from dark until daylight; said light to be suspended conspicuously midships, fifteen feet above the deck of the vessel. The master, owner, or other person having charge of any ship, vessel, or steamer, making default herein, shall be liable to a penalty of five dollars for every offense.

12. In Charleston Harbor, the deposit of material will be permitted only along the shore of Hog Island, in said harbor, and not more than one-quarter of a mile from said island, or in Ashley River along the James Island shore, in water not more than 12 feet deep at the time of dumping. It is ordered that all such material be dumped thereon, and nowhere else. Every violation of this rule shall be subject to a penalty for each and every offense of not less than fifty dollars, nor more than one hundred dollars, to be recovered according to law, of the master or owner of the offending tug or vessel.

13. Should any hulk, raft, flat, or other obstructive substance become sunken from any cause, in or near any dock or wharf, or within the harbor and its tributaries, where it might be of danger to navigation, the same shall be immediately removed, under a penalty of five dollars, for each and every day such nuisance shall remain, after notice from the harbor master, to be paid by the parties interested or concerned; and in case exertions are not immediately made for the removal aforesaid, the commissioners may exercise their discretion of using other means of abating the nuisance, even to the confiscation or condemnation of such obstructions.

Fees or taxes.—1. For the purpose of meeting the expenses attendant upon the execution of the foregoing regulations, and providing for the safety and proper accommodation of vessels at this port, the following tax or fee is imposed upon all vessels arriving here, and will be collected by the harbor master upon their arrival in such manner as shall be most expeditious:

Coastwise—Steamships, monthly	$6.60
Schooners, per trip	2.00
Brigs, per trip	2.50
Foreign—Steamships, per trip	12.00
Barks, per trip	6.00
Brigs, per trip	3.00
Schooners	3.00

Anchorages.—The anchorage grounds include all the navigable portions of the harbor, and the portions of Cooper, Ashley, and Wando Rivers adjacent thereto, except for certain prescribed areas. On account of submarine cables, vessels are cautioned not to anchor northeastward of Fort Sumter, between it and Sullivans Island. The lower anchorage has good holding ground, but it is somewhat exposed to southeast winds; this also applies to the anchorage southeastward of the city. The best anchorage is in the mouth of Cooper River about 1 mile above the city.

Areas of prohibited anchorage.—(*a*) That portion of Cooper River which is bounded on the north by a true east-and-west line through the North Customhouse Wharf, on the east by Shutes Folly Island, on the south by a true east-and-west line through the south shore of Shutes Folly Island, and on the west by the water front of Charleston.

(*b*) A ship channel between the jetties and the navy yard 600 feet wide (or as much wider as an improved channel may hereafter be dredged), following the established ranges and usual courses and passing east of Drum Island. Between the North Customhouse Wharf and the Charleston Dry Dock & Machine Co.'s dock this shall include all the area between the eastern limit of said channel and the eastern water front of Charleston.

(*c*) A ship channel 600 feet wide from the vicinity of the Charleston Dry Dock & Machine Co.'s dock north through Town Creek Channel, following the established ranges and usual courses and connecting at both ends with the main channel.

(*d*) A ship channel in Ashley River from its mouth to Standard Wharf, 200 feet wide, following the established ranges and usual courses, and widened at the eastern end to connect with the main channel in Cooper River.

(*e*) The commonly used channel in Wando River, with width of 200 feet.

(*f*) A channel 200 feet wide in Hog Island Channel from Cooper River to the Mount Pleasant ferry terminal, having its northern limit along the line of lighted beacons in Hog Island Channel.

(*g*) An area 1,200 feet wide extending from Ripley Shoal Light toward the head of the Seaboard Air Line Wharf (foot of Hassell Street) to its junction with the prohibited area described in (*a*) above.

(*h*) An area 1,200 feet wide extending from Ripley Shoal Light to Fort Sumter Light, with its axis connecting those structures.

(*i*) An area 1,200 feet wide extending from Fort Sumter Light to Old Fort Moultrie, with its axis connecting the centers of those structures.

Anchorage for explosives.—Vessels carrying gunpowder or other explosives in bulk may anchor only in that section of the Wando River which lies on the west side of that river, between a point opposite the south end of Daniel Island and a point about 1 mile to the north: Provided, That vessels carrying high explosives in bulk[5] shall not anchor within 400 yards of each other, but this provision is not intended to prohibit lighters from tying up alongside ships for the transfer of cargo.

Rules and regulations.—1. Excepting in cases of great emergency, no vessel shall be anchored in the prohibited areas above mentioned and described.

2. Anchors must not be placed within the areas of prohibited anchorage, but vessels may be so anchored as to swing into these areas, provided that they are so placed, with reference to the customary winds, tides, and currents of the harbor, that they will so swing only during slack water.

3. Vessels must be anchored in such way as not to interfere with the free navigation of channels of the port, including Cooper, Ashley, and Wando Rivers, or to obstruct the approach to any pier or entrance to any slip, or to impede the movement of any ferryboat.

4. Except in cases of great emergency, no craft shall be so anchored that it can swing within 400 feet of any wharf or pier on the eastern water front of Charleston, S. C.

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[5] The term "high explosives in bulk" shall be construed to mean high explosives packed in boxes, barrels, or kegs, and not loaded in ammunition or shells. The standard definition of the term "high explosives" will be that contained in paragraph 1503 of the regulations of the Interstate Commerce Commission for the transportation of explosives by rail, viz: "High explosives are all explosives more powerful than ordinary black powder, except smokeless powder and fulminates. Their distinguishing characteristic is their susceptibility to detonation by a blasting cap. Examples of high explosives are the dynamites, picric acid, picrates, chlorate powders, nitrate of ammonia powders, dry trinitrotoluol, dry nitrocellulose (guncotton), and fireworks that can be exploded en masse." Unless they are loaded in the same vessels with articles enumerated in the rate quoted above, picric acid 10 percent wet, and trinitrotoluol 10 percent wet, and nitrocellulose (guncotton) 20 percent wet will not be classified as high explosives. The term "high explosives in bulk" does not include such articles as benzol, toluol, smokeless powder, black powder, small-arms ammunition, ammunition for cannon with explosive projectiles, explosive projectiles or torpedoes, percussion fuzes, time fuzes, combination fuzes, tracer fuzes, cordeau detonant, primers for cannon and small arms, blasting caps, detonating fuzes, and fulminate of mercury in bulk. Blasting caps, detonating fuzes, and fulminate of mercury in bulk will be considered as constituting a distinct class by themselves. The act of Congress approved March 4, 1921, imposes certain restrictions upon the transportation of explosives by common carriers engaged in interstate or foreign commerce, and also provides that "The Interstate Commerce Commission shall formulate regulations for the safe transportation within the limits of the jurisdiction of the United States of explosives and other dangerous articles, including inflammable liquids, inflammable solids, oxidizing materials, corrosive liquids, compressed gasses, and poisonous substances, which shall be binding upon all common carriers engaged in interstate or foreign commerce which transport explosives or other dangerous articles by land or water, and upon all shippers making shipments of explosives or other dangerous articles via any common carrier engaged in interstate or foreign commerce by land or water." Other vessels will be governed by the following rules: (*a*) Where blasting caps, detonating fuzes, and fulminate of mercury in bulk are loaded on the same vessel with high explosives, they must be in a different compartment, the distance in a straight line from the compartment containing them to the explosives to be not less than 25 feet. (*b*) In transferring high explosives in bulk, blasting caps, detonating fuzes, and fulminate of mercury from one vessel to another they must be handled by hand or regulation chute and mattress. If difference in elevation between vessels or condition of weather renders it impossible to transfer or load by hand or chute, mechanical hoists and a special crate or basket may be used. Explosives transferred in this manner must not be handled roughly. They must be hoisted and lowered carefully and only deposited or lowered on a mattress.

5. Except in cases of great emergency, no light vessel (vessel not laden) nor small craft shall be anchored in Cooper River north of an east-and-west line through the North Customhouse Wharf unless proper anchorage space is not available elsewhere in the harbor, including the connected rivers.

6. Dragging of anchors in or across the areas described above, under (*a*) to (*i*), inclusive, is prohibited.

7. Vessels which, through force of great emergency, are anchored contrary to the above rules shall be shifted to new berths in accordance with such rules at the earliest opportunity.

8. A vessel, upon notification from the captain of the port to shift its position on anchorage grounds or out of areas of prohibited anchorage, must get under way at once or signal for a tug, and must change position as directed with reasonable promptness.

9. Vessels carrying explosives shall be anchored only within the anchorage ground described above under the heading "Anchorage for explosives", which may be used also by vessels carrying other classes of freight when proper anchorage space is not available elsewhere in the harbor, including the connected rivers.

10. Vessels carrying explosives shall be at all times in charge of competent persons and must display by day a red flag, of at least 16 square feet, at the masthead, or at least 10 feet above the upper deck if the vessel has no mast; at night a red light shall be displayed in the same positions specified for the red flag. No smoking will be permitted on or near such vessels, and no persons under the influence of liquor will be allowed on board any vessel, barge, or scow carrying explosives, nor will they be allowed to approach such vessels.

11. Nothing in these rules and regulations shall be construed as relieving the owner or person in charge of any vessel from the penalties of the law for obstructing navigation, or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, etc.

Terminal facilities.—Piers and slips extend for about 1 mile along the eastern water front of the city of Charleston, and an additional mile is covered by marginal wharves. A number of these piers and wharves are owned by railroads and steamship companies and are used practically for their own business. The port utilities commission of the city of Charleston owns the terminals at Columbus Street, a large pier near Market Street, and two piers at Tradd Street. It also owns and operates the belt line railway serving all wharves and warehouses and connecting with trunk lines entering the city. Its wharves are open to the public on a charge basis. The commission has made extensive improvements at its terminal property and piers. Modern facilities exist also at the coal pier of the Southern Railway and at the property of the Charleston Dry Dock & Machine Co. The Clyde Steamship Co. and the Seaboard Air Line Railway Co. have mechanical unloaders at their wharves.

On the Cooper River, above the navy yard, a compress and warehouse company has a marginal wharf 700 feet long; and about 9 miles from the city the port terminals, built for Army purposes and to some extent still so used, are now leased by the port utilities commission of the city from the United States Shipping Board for commercial purposes. A 27-foot (8.2 m) channel leads to these marginal wharves, 2,030 feet long, where modern facilities exist for transfer of freight between ships and railroads, and extensive warehouses and rail connections are provided.

On the Ashley River the terminal facilities extend 5 miles above the Municipal Wharf at Tradd Street and include the United States Lighthouse Wharf, Ashepoo Fertilizer Wharf, Planters Fertilizer Wharf, and the Chicora and the Standard Wharves of the Virginia-Carolina Chemical Co. The four last named are equipped with mechanical unloading devices. Since the principal business on this

river is the mixing of fertilizers, these terminals are adequate for existing commerce on this river.

The regulations in regard to fires on board vessels lying at the cotton wharves are very strict.

Supplies.—Coal, either anthracite or bituminous, in large quantities for steamers, can be had alongside the wharves or from lighters in the stream. Fuel oil may be had. Water can be had alongside the wharves or from water boats. Provisions and ship chandler's stores can be obtained in the city.

Repairs to machinery of steamers and to hulls of vessels can be made; there are marine railways here capable of hauling out a vessel up to 1,500 tons. There is a floating dry dock of 10,000 gross tons capacity, and it will take a vessel 444 feet long and 22½-foot (6.7 m) draft.

Towboats will sometimes be found cruising outside the bar; the deeper-draft sailing vessels tow in and out. All sea-going sailing vessels bound into Cooper and Ashley Rivers employ towboats, either outside the bar or at Charleston. Towboats can always be had by making signal while outside the bar, at the wharves, or may be ordered from the towboat offices in the city. **Wrecking and salvaging** equipment is available at Charleston.

Communications.—Charleston is served by the following trunk lines: The Southern Railway System, the Atlantic Coast Line, the Seaboard Air Line, and the Charleston and Western Carolina Railroad Company. There are regular steamship connections with foreign, intercoastal, and coastwise ports. The highway connections are excellent. There is regular airplane service to New York and Jacksonville, and wesward to Atlanta and Augusta.

Aviation fields.—The **Charleston Municipal Airport** is lighted and equipped with a hangar, concrete taxi strip, and necessary additional buildings.

The **United States Navy Air Field** at the Charleston Navy Yard is available for emergency use of commercial planes. It has cross runways 1,800 and 1,200 feet respectively.

Moffett Flying Field is a privately owned emergency field located at Secessionville on James Island.

Yacht basin.—A municipal yacht basin has recently been constructed on the east side of the Ashley River at the foot of Calhoun Street W., and opposite the entrance to the Intracoastal Waterway southward. The controlling depth in the basin is 8 feet (2.4 m), and 11 feet (3.4 m) in the entrance channel. Gasoline, fuel oil, fresh water, and some supplies are available. A nominal charge is made for dockage.

Storm warnings are displayed from the customhouse at Charleston, at Moultrieville and at the United States Lighthouse Service depot on the Ashley River.

United States Public Health Service.—Medical attendance is furnished by a medical officer of the service. Seamen requiring long-continued hospital treatment are sent to the marine hospital at Savannah, Ga.; for short terms of hospital treatment they are sent to one of the hospitals in the city.

The United States Customhouse is located at the foot of Market Street.

Tides.—See the tide tables for the Atlantic Ocean, in which the tides are predicted for every day at Charleston. At Fort Sumter the tides occur approximately 5 minutes earlier than at Charleston. The mean range at Fort Sumter is about 5 feet (1.5 m).

The **tidal currents** off the entrance are rotary. (See the results of observations at Charleston Lightship on page 32.)

The tidal currents between the jetties and in Charleston Harbor generally set fair with the channel near its axis. At a point about 1 mile outside Fort Sumter branches from the main ebb current set through the openings between the jetties and the shore with a velocity of about 2 knots at strength. The maximum velocities at the strengh of the ebb are about 3 knots between the jetties, 3 knots between Fort Sumter and Fort Moultrie, and 2 knots in the South Channel and off the eastern front of Charleston; the velocity of the flood current is less than the ebb, depending on the freshet flow from the rivers. Daily predictions of the times of slack water and the times and velocities of strength of flood and ebb for Charleston Harbor entrance (between the jetties) are given in the Atlantic Coast Current Tables.

9. CHARLESTON ENTRANCE TO TYBEE ROADS

(Charts 1239, 479, 434, 436)

From Charleston Entrance to Tybee Roads the coast trends in a southwesterly direction for a distance of about 65 miles. The coast is low and timbered and is broken by St. Helena, Port Royal, and Calibogue Sounds and numerous inlets from which there is access to the hinterland by means of the rivers which empty into them. Shoal water extends offshore in distances varying from 3 to 8 miles.

The **Intracoastal Waterway** passes through the sounds and the connecting waterways and affords passage to vessels whose draft will permit the navigation of Brickyard Creek above Beaufort, S. C., where there is a controlling depth of 5 feet (1.5 m) at mean low water. The mean range of tide at Beaufort is 7.3 feet (2.2 m). The project depth for this section of the waterway is 7 feet (2.1 m) at mean low water. For a description of this section of the route see the **Inside Route Pilot, New York to Key West.**

CHARLESTON ENTRANCE TO ST. HELENA SOUND

(Charts 1239, 434, 436)

Lighthouse Inlet is about ½ mile south of Charleston Lighthouse. There is no channel across the bar and entrance should only be attempted with local knowledge and at flood tide on a smooth day. Passage is not possible for boats of over 3-foot (0.9 m) draft. The inlet is used only by local fishermen. Small boats pass into Charleston Harbor via Lighthouse Creek and also into the numerous slues north of Folly Island.

Folly Island is an amusement park beach resort on an island of the same name lying between Lighthouse and Stono Inlets. It is connected by a good highway with Charleston. The buildings and lights are plainly visible from seaward. There are no piers on the ocean side, but small boats bound for Folly Island come to Folly River. Practically all these boats come from Charleston Harbor, via Light-

house Creek and the narrow crooked passages which connect it with Folly River; or via the **Intracoastal Waterway** through Wappoo Creek, Elliott Cut, and Stono River.

Stono Inlet is about 7 miles southwestward of Charleston Lighthouse. The entrance of the inlet is obstructed by a shifting bar and is marked by a black and white vertically striped buoy. The channel across the bar to the inlet is marked by two buoys. In 1934, with local knowledge, a draft of 7 feet (2.1 m) could be taken into Stono River at mean low water. The entrance is used by local fishermen.

Stono River empties into the inlet from northward, about 1¾ miles above the entrance. On the west bank of the river, 3¼ miles above the entrance of the inlet, is the village of **Legareville**. The river is of little commercial importance. Its upper reach, above Elliott Cut, forms part of the inland passage from Charleston to Savannah. Vessels enter the river by the **Intracoastal Waterway** from Charleston. During the summer months numerous pleasure craft belonging to residents on Folly Beach use this means of reaching the resort via Folly River.

Folly River enters Stono Inlet from the north and **Kiawah River** from the south. Both are relatively unimportant. Folly River is used by pleasure craft and local fishermen desiring to reach Folly Beach. The vertical clearance at Folly River Bridge is 14.5 feet (4.4 m) at mean high water.

North Edisto River entrance is 17 miles southwestward of Charleston Lighthouse and 17 miles northeastward of Hunting Island Beacon (unused lighthouse). There is a prominent water tank on the eastern point of the entrance. The river is of little commercial importance and rarely used. Shoals extend offshore over 3 miles at the entrance of the river, forming a shifting bar over which there is a channel depth of about 10 feet (3.0 m). This channel is marked by buoys which are moved, when practicable, to indicate the best water. It is well defined by breakers. Pilots can be obtained at Charleston. A 9-foot (2.7 m) spot was found near midchannel, 2,550 yards 303° true from Bohicket Creek Light.

Two of the tributaries of North Edisto River, **Wadmalaw River** from eastward and **Dawho River** from westward, are part of the **Intracoastal Waterway** from Charleston to Savannah. The entrances to Bohicket Creek, Steamboat Creek, and Dawho River are marked by lighted beacons. **Rockville** is a village on **Bohicket Creek**, 2½ miles above the entrance of North Edisto River. A draft of 14 feet (4.3 m) can be carried up Bohicket Creek to Rockville. There are two docks and fresh water can be obtained at one of them.

Yonges Village (Yonges Island post office) is a small settlement and railroad terminus on the west bank of the Wadmalaw River. It is connected with river towns and settlements by steamboats. Gasoline and some supplies can be obtained here. A depth of 7 to 8 feet (2.1 to 2.4 m) can be taken alongside the wharves. There is a marine railway here capable of hauling out a vessel 90 feet long and 6-foot (1.8 m) draft. This railway is owned by a transportation company and usually occupied by the company's vessels.

The mean rise and fall of tides in North Edisto River entrance is about 6 feet (1.8 m). On the bar the direction of the current is generally across the channel. The flood current sets about westward

and the ebb eastward, and both have considerable velocity. Inside the bar, in the channel between the breakers, the ebb current is to be guarded against, particularly as it sets across the north breakers.

South Edisto River empties into the Atlantic about 8 miles northeastward of Hunting Island Beacon (unused lighthouse) and just eastward of St. Helena Sound entrance. The river is of little commercial importance, but it is navigable for flatboats and rafts for a distance of about 220 miles above its mouth. From the entrance to Dawho River it is known as South Edisto, and above Dawho River it is known as **Edisto River**.

The stretch of the river between Fenwick Island Cut and Watts Cut forms part of the **Intracoastal Waterway**. Near the junction of Dawho and Edisto Rivers the water is generally fresh and suitable for boilers. **Jacksonboro** is a village on the railroad about 27 miles above the mouth of the river, to which point a draft of 7 feet (2.1 m) can be taken at high water.

The entrance of the river is obstructed by a shifting bar which forms a part of the extensive shoal which makes offshore for a distance of about 6 miles from the entrance to St. Helena Sound. The depth over the bar into South Edisto River, according to the latest survey (July 1934), was 16 feet (4.9 m), through an unmarked channel. The river is entered by way of the inside route, and the entrance from sea is not used. Pilots for the bar and river may be obtained from Charleston or Beaufort, S. C. The mean rise and fall of tides is about 6 feet (1.8 m). The currents at the entrance have a velocity of about 2 knots.

ST. HELENA SOUND

(Chart 436)

is the broadest opening in the coast between Chesapeake entrance and the Gulf of Mexico. From Bay Point on the east to Hunting Island on the west the entrance is 6½ miles wide. About 1¼ miles from the northern end of Hunting Island is Hunting Island Beacon, the principal guide to the entrance. Shoals make off for a distance of 6 miles seaward from the entrance, through which there are several channels leading into the sound. The principal channel has a depth ranging from 16 to 18 feet (4.8 to 5.5 m) and is marked by buoys which are moved to indicate the best water.

A number of navigable rivers empty into the sound, the most important of which are Coosaw, Ashepoo, Bull, Combahee, Morgan, and Harbor Rivers. Ashepoo and Coosaw Rivers and Brickyard Creek are a part of the section of the **Intracoastal Waterway** between Charleston and Savannah.

Hunting Island Beacon is a conical tower, lower part white, upper part black. The light has been discontinued.

Coosaw River empties into the head of the sound about 5 miles above its entrance. It is important only as a part of the **Intracoastal Waterway**. The channel in the river is irregular in depth, having been made so partly by the phosphate dredges which operated here. It is buoyed for a distance of about 10 miles to the mouth of Brickyard Creek and a depth of 15 feet (4.5 m) can be taken to this point at high water. The mean rise and fall of the tide in the vicinity of the mouth of Brickyard Creek is about 7 feet (2.1 m).

Brickyard Creek connects Coosaw and Beaufort Rivers and has a depth of 5 feet (1.5 m). The channel of the **Intracoastal Waterway** through Brickyard Creek is well marked by beacons. **Whale Branch** connects Coosaw and Broad Rivers and has a least depth of about 7 feet (2.1 m). Two drawbridges cross the branch about 4½ and 5½ miles westward of the entrance to Brickyard Creek.

Bull River empties into Coosaw River from northward about 5 miles above its mouth. There are the ruins of a phosphate plant and wharf on the west bank of the river about 2 miles above its mouth, and there is a least depth of about 17 feet (5.2 m) in the river to it. On the opposite bank and just inside the mouth of a creek are the buildings of a closed national quarantine station. **Chisholm** is a small settlement on the west bank of the river about 3½ miles above its mouth. **Williman Creek** has a depth of about 5 feet (1.5 m) around the northeast side of **Williman Island**.

North Wimbee Creek, southward of Williman Island, is nearly dry in places at low water.

Combahee River empties into Coosaw River from northward about 2 miles above its mouth. The river is unobstructed for a distance of 52 miles above its mouth, except by the Seaboard Air Line Railway and the highway bridges, 11 and 18.6 miles respectively from the Coosaw River, to the Atlantic Coast Line Railroad bridge (closed), and is navigable for this distance by boats of about 5-foot (1.5 m) draft. The tides have a range of about 6 feet (1.8 m) at the mouth of the river and 4.5 feet (1.4 m) at the highway bridge.

Old Chehaw River empties into Combahee River about 3 miles above its mouth; about 1 mile above the junction of Old and New Chehaw Rivers are the ruins of the lumber mill and village of **Wiggins**.

New Chehaw River empties into Combahee River at its mouth; it is unimportant and has no traffic.

Ashepoo River empties into St. Helena Sound from northward just inside the entrance; for a distance of 2¾ miles above the entrance to Fenwick Island Cut the river forms part of the **Intracoastal Waterway** between Charleston and Savannah. At high water a draft of about 6 feet (1.8 m) can be taken approximately 30 miles above the entrance to the Atlantic Coast Line Railroad drawbridge, and boats have gone to within 8 miles of the town of **Walterboro**. The Seaboard Air Line Railway crosses the river 19 miles above the entrance. There are no settlements of any importance on the river.

Morgan River empties into St. Helena Sound from westward. It is about 9 miles long and at its head connects with Chowan Creek, a tributary of Beaufort River; at the divide this passage is nearly dry at low water. The best entrance to Morgan River is through **Parrot Creek**, which has a depth of 13 to 14 feet (3.9 to 4.2 m) and leads from Coosaw River nearly opposite the mouth of Bull River. There is also an entrance with a depth of 8 feet (2.4 m), through **Lucy Point Creek**, also known as **Dales Creek**. It is marked by a red and black beacon off Sams Point. There is a wharf and an oyster-packing plant just inside of the creek. The mean range of tide near the head of Morgan River is about 7 feet (2.1 m).

Harbor River empties into St. Helena Sound from the southwestward. At its head the river connects with **Story River** and the latter with **Station Creek**, forming an inland waterway with a least depth of

about 4 feet (1.2 m) from St. Helena Sound to Port Royal Sound; but this passage is rarely used.

Pilots for the sound can be had by writing or wiring to Beaufort, S. C.; Charleston pilots will sometimes take vessels into the sound. Pilotage is compulsory for certain vessels. For pilot rates, see page 172.

Towboats.—The nearest place to obtain a towboat is either Charleston or Savannah. Vessels sometimes tow to St. Helena Sound from Charleston and Savannah.

Tides.—The mean rise and fall of tides on the bar and entrance to St. Helena Sound is about 6 feet (1.8 m).

COAST FROM ST. HELENA SOUND TO TYBEE ROADS

(Charts 1240, 436, 571, and 440)

The general trend of this part of the coast is southwesterly and its length 30 miles. It presents the same characteristic features when viewed from seaward as that to the eastward. It is broken by one opening of importance, Port Royal Sound, situated about midway between St. Helena and Tybee, and four shallow and unimportant inlets, Fripp, Skull, Pritchard, and Trenchard.

Fripp Inlet is obstructed by shoals at its mouth, over which but 3 or 4 feet (0.9 or 1.2 m) can be taken in the smoothest weather. **Harbor River,** entering into the inlet at its head, connects with St. Helena Sound to the eastward, and **Story River** connects to the westward with Trenchard Inlet.

Between Fripp Inlet and Trenchard Inlet, **Fripp Island, Pritchard Island,** and **Capers Island** form the seacoast. They appear to be densely wooded, except the last mentioned, near Trenchard Inlet, where it is low and marshy, with a white sandy beach, with sand dunes 15 feet (4.5 m) high. **Skull Inlet,** which separates Fripp Island from Pritchard Island, is a narrow passage, with very little water on the bar. **Pritchard Inlet,** separating the island of that name from Capers Island, is a stream of the same description.

Trenchard Inlet is of but little importance. Its bar extends about 3 miles from shore and had by the last survey (1921) a least depth of about 5 feet (1.5 m) in a narrow unbuoyed channel. There is a swash channel, close under the western point of Capers Island, which carries a depth about 6 feet (1.8 m) into the inlet. There is also a shoal channel to Port Royal Sound, south of Phillips Island to Bay Point. Station Creek connects this inlet with Port Royal Sound to the westward.

Phillips Island forms the west bank of Trenchard Inlet and extends as far as Port Royal Sound. It is wooded in the vicinity of the former and also in the vicinity of Bay Point, its western extremity, but between these the land is low and marshy.

To the westward of Port Royal Sound is **Hilton Head Island.** It is over 10 miles in length and is nearly 5 miles in width on its northern face, tapering to a rounded point at its western end. It is heavily wooded over most of its surface, but there are some cleared and cultivated farms in the vicinity of Skull Creek. The towers of the old Hilton Head range show on its seaward side. Inside this island Skull Creek and Calibogue Sound form a portion of the **Intracoastal Waterway** between Port Royal Sound and Tybee Roads.

PORT ROYAL SOUND

(Chart 571)

is the largest and best unimproved harbor on the coast of South Carolina; between Bay Point on the northeast and Hilton Head on the southwest the entrance is about 2 miles wide. Shoals extend 8 miles in a general south-southeast direction from the entrance, forming a bar at the outer part, through which there are two channels. **Southeast Channel** is the principal one and is marked by buoys, and by the last survey had a least depth of about 21 feet (6.4 m). South Channel is not marked and is not used.

Port Royal Sound Entrance Lighted Whistle Buoy PR is moored in 42 feet (12.8 m) and marks the channel entrance into Port Royal Sound. The buoy shows a short-long flashing white light (a short flash of about 0.4 second, and a long flash of 4 times that duration, such groups repeated about 8 times a minute). There is a whistle on the buoy.

Beaufort River empties into the sound from the northward and just inside of Bay Point. It is the approach to Beaufort, Port Royal, and the United States Marine Training Station, and with Brickyard Creek forms a part of the principal inside route passage. Beaufort is about 10 miles above the mouth of the river and can be reached with local knowledge at low water by vessels of 13-foot (4.0 m) draft; there are depths of 12 to 14 feet (3.7 to 4.3 m) alongside the wharves.

Station Creek empties into Beaufort River from eastward at its mouth; with Story and Harbor Rivers it forms an inside route passage, with a least depth of about 4 feet (1.2 m), between Port Royal Sound and St. Helena Sound. There is a group of prominent palmettos on the north shore near the mouth of the creek.

Chowan Creek (Johnsons River) empties into Beaufort River from eastward 5 miles above Bay Point and at its head connects with Morgan River; passage through this waterway to St. Helena Sound is now completely blocked by shoals and a fixed highway bridge.

Battery Creek empties into Beaufort River 7 miles above Bay Point; just inside its entrance is the town of Port Royal, a railroad terminus. A draft of 21 feet (6.4 m) can be carried to the dock in Battery Creek from Beaufort River. There is a depth of 17 feet (5.2 m) alongside the dock at Port Royal. A light is established at the end of the shoal making off the north entrance point to Battery Creek.

Archer Creek is a narrow passage leading westward from the mouth of Battery Creek to Broad River. It is an alternate route of the **Intracoastal Waterway** with a controlling depth of 4 feet (1.2 m). No maintenance work is being done to keep this waterway to project depth. The eastern entrance north of the small island is closed at low water. The western entrance is marked by Archer Creek Beacon No. 1 which is left to westward when entering. Passage without local knowledge is not recommended.

Broad River extends northwestward from the head of Port Royal Sound and is about 16 miles long; with the aid of the chart it is not difficult to Whale Branch. The Seaboard Air Line Railway crosses Broad River 3 miles above Whale Branch. **Pocotaligo, Tulifiny,** and

Coosawhatchie Rivers empty into the head of Broad River; these rivers are said to have a depth of about 1½ feet (0.4 m) at low water to the closed highway bridges which cross them below the Atlantic Coast Line Railroad.

Chechessee River empties into the head of Port Royal Sound from westward; **Colleton River**, one of its tributaries, is of little importance but has a good channel for a distance of 5 miles. A depth of 24 feet (7.3 m) can be taken up the Chechessee to the mouth of the Colleton River, and 20 feet (6.1 m) up the latter for a distance of 5 miles. These rivers are of no commercial importance.

Mackay Creek enters into Chechessee River from the westward about 1 mile above the mouth. An unused and unlighted route from Port Royal Sound lies through Mackay Creek past the north side of Pinckney Island, and parallel with Skull Creek. This passage is more difficult than the route through Skull Creek but equally deep water is found by those having local knowledge.

Skull Creek enters Port Royal Sound from southwestward about 4 miles above **Hilton Head**. The creek forms part of the **Intracoastal Waterway** and is well marked. The controlling depth is 17 feet (5.2 m). Sailing vessels loaded to 16½ feet (5.0 m) were formerly towed from Calibogue Sound and tributary waters through Skull Creek at high water and thence to sea through Port Royal Sound. There is an oyster factory and wharf 1 mile from its western end at **Seabrook Landing**.

Beaufort, S. C., population 2,776 in 1930, is on a point of land stretching out from the west bank of Beaufort River 10 miles above its mouth and 3 miles below Brickyard Creek. It is on the Charleston & Western Carolina Railway and has steamboat connections with Savannah and Charleston. The wharves are at the southern extremity of the point on which the city is located and are at the only part of the point that may be approached by vessels; depths of 12 to 14 feet (3.7 to 4.3 m) are found at the wharves. The city has good highway connections with Savannah, Charleston, and other points in the State, and good hotel accommodations are available. Moderate quantities of fish and shrimp and a large amount of plantation products are handled on the water front. There is fair anchorage in the stream off the wharves. The mean range of tide is 7.4 feet (2.3 m).

Port Royal, S. C., on the north bank of Battery Creek, is the terminus of the Charleston & Western Carolina Railway. It has highway connections with Beaufort and other points inland and to Parris Island. There is a depth of 17 feet (5.2 m) alongside the railway wharf and space to accommodate any vessel that can enter the sound. Considerable shrimp and fish are shipped from here. Aside from handling supplies for Parris Island, there is little commercial activity at Port Royal at present. The railway wharf is maintained in good condition.

Parris Island.—A United States Marine Corps training station is located on Parris Island.

Anchorages.—The usual and best anchorage is in the mouth of Beaufort River, abreast the mouth of Station Creek; southward of Bay Point the holding ground is poor. There is good anchorage, with a depth of about 4 fathoms (7.3 m), in the channel of Beaufort

River within ⅓ mile of the wharf at the Marine Training Station. The sound is sometimes used as a harbor of refuge in winter.

Pilots.—Licensed pilots may be had by engaging one in advance from Beaufort. There are none cruising off the bar excepting when a vessel is expected. Pilotage is compulsory for certain vessels.

Pilotage.—Following are extracts from the rules and regulations for pilots and pilotage for Port Royal and St. Helena bars and adjacent waters, prescribed by the board of pilot commissioners, Beaufort, S. C., in 1923:

1. The pilot ground shall extend from St. Helena and Port Royal bars 30 miles to eastward, southward, and westward, including inland waters, and to each pilot is issued a license, together with a copy of the rules and bylaws and regulations of his district, and he is to produce them when required to do so by anyone employing him.

2. Any master of a vessel bearing toward either of said bars, who shall refuse to receive on board a licensed pilot, who shall offer his services, shall be liable on his arrival to pay the pilot who first offered to board his vessel the rates and fees allowed and established, as hereinafter mentioned, as if such pilot had actually brought the vessel into port: *Provided*, That if a pilot having a 9- or 12-foot branch is refused by the master of a vessel of greater draft, such master shall not be held for pilotage: *And provided also*, That if a pilot refuses to produce his license to the master of a vessel when the latter demands it, against the master rejecting the services, the fees of pilotage of such pilot shall not be charged.

3. All vessels in the above-named waters will be held for full amount of pilotage to pilot entitled to the same, whether his services are accepted or not.

4. Every pilot cruising or standing out to sea shall offer his services to the vessel nearest the bar under penalty of suspension, unless he sees a more distant vessel in distress.

5. If any boat or vessel with a pilot on board leads any other vessel which has no pilot on board and could not obtain one, the pilot so leading is entitled to full pilotage the same as if he had been on board such vessel.

6. No pilot is to be taken to sea beyond the limits of his district. If he is so taken, he shall be entitled to $4 per day, besides his traveling expenses back, and to be provided with provisions in same manner as the master, except in cases where vessels shall have laid to for the space of 12 hours after crossing the bar and no pilot boat shall then appear to receive such pilot on board.

12. It shall be the duty of a pilot to remain on board a vessel outward bound, if required by the master, at the rate of $4 per day; and in case of refusal or neglect, the pilot shall be deprived of his license.

14. The pilot first boarding or speaking a vessel that has come in without a pilot shall be entitled to carry her out.

16. The pilot who brings in a vessel has the exclusive right to carry her out, unless the master of such a vessel, within a fortnight, shall prove to the satisfaction of the commissioners of pilotage, or a majority of them, that the said pilot had misbehaved during the time he had charge of such vessel, or unless the said pilot shall have been deprived of his license in the meantime, in either of which cases another pilot may be assigned to such vessel by the commissioners of pilotage, or a majority of them.

17. Every pilot having the right to carry out a vessel shall either attend in person or procure another pilot of his own class to attend for him upon such outward-bound vessel, after 12 hours' notice of the master, by flying his jack for that time during daylight; but if such pilot neither attends himself or substitutes another pilot, then the master of such vessel shall be at liberty to procure another pilot, after the expiration of the above limited time: *Provided*, That the master flies his signal for a pilot at the mouth of Combahee River and St. Helena Sound, or at the town of Port Royal for 12 hours, including all outward-bound vessels from Chehaw River and Chisolms Island and other interior points.

19. Any pilot who brings in a vessel shall have a right to demand his fees of pilotage and the lawful charges before her departure from port, and whenever a pilot having the right to carry out a vessel is apprehensive that his fees of pilotage may not be paid by the master, owner, or consignee, he shall have the right to demand his fees in advance, or such security for the payment thereof as shall be satisfactory.

20. The owner, master, or consignee of any ship or vessel for the consideration of the pilotage of said vessel inward to, or outward from the port or ports of Port Royal and St. Helena Sound, or through the inland waters, shall pay to the licensed pilot who shall take charge of the same the several sums of money, rates, and fees set forth in the following schedule, according to her draft of water at the time of pilotage.

Pilotage rates.—Following are the rates of pilotage for the bars, harbors, and inland waters:

Rates of pilotage

Draft	Amount	Draft	Amount	Draft	Amount
6 feet	$18.00	16½ feet	$85.00	24 feet	$160.00
7 feet	21.00	17 feet	90.00	24½ feet	165.00
8 feet	24.00	17½ feet	95.00	25 feet	170.00
9 feet	27.60	18 feet	100.00	25½ feet	175.00
10 feet	31.30	18½ feet	105.00	26 feet	180.00
11 feet	35.40	19 feet	110.00	26½ feet	185.00
12 feet	40.00	19½ feet	115.00	27 feet	190.00
12½ feet	43.50	20 feet	120.00	27½ feet	195.00
13 feet	47.31	20½ feet	125.00	28 feet	200.00
13½ feet	51.43	21 feet	130.00	28½ feet	205.00
14 feet	55.86	21½ feet	135.00	29 feet	210.00
14½ feet	60.60	22 feet	140.00	29½ feet	215.00
15 feet	65.98	22½ feet	145.00	30 feet	220.00
15½ feet	71.63	23 feet	150.00		
16 feet	80.00	23½ feet	155.00		

Each drop, $10; detention, $4 per day; dockage, $4.

From Port Royal to Wilsons Mill	$12.00
From Port Royal to Sewardville	12.00
From Port Royal to Bull River (without steam)	30.00
From Port Royal to Bull River (with steam)	15.00
From Beaufort to Bull River (without steam)	25.00
From Beaufort to Bull River (with steam)	12.50
From Beaufort or Port Royal to Calibogue	25.00

Towboats.—Sailing vessels seldom employ towboats either over the bar or in Beaufort River. Towboats can be had at Charleston or Savannah.

Supplies.—Water and coal can be had alongside the wharves at Port Royal, and provisions, water, and gasoline at Beaufort.

Repairs.—The nearest place where a large vessel can be hauled out is Savannah. There is a small marine railway on the Ladies Island shore of Beaufort River above the highway bridge at Beaufort. Vessels of 50-foot (15.2 m) length and 5½-foot (1.7 m) draft can be hauled out and minor engine repairs can be made.

Storm warnings.—Storm warnings are displayed from a signal station at Port Royal.

Tides.—The mean rise and fall of tides on the bar is about 6½ feet (1.9 m) and at Beaufort about 7½ feet (2.2 m).

Currents.—The currents on the bar have an estimated velocity of 1½ knots, and set fair with the channel. The currents in the sound have a velocity of 2 knots or more at times, and the tide rips on Fishing Rip and Middle Shoal have the appearance of breakers at times.

DIRECTIONS, PORT ROYAL SOUND

(Chart 571)

The channel between the shoals from the entrance of Port Royal Sound out to the bar has maintained its position practically without change since the first survey was made in 1856, the only change noted having occurred on the bar or in its vicinity. On the bar, Northeast Breakers and Southeast Channel have moved bodily southward, nearly 1 mile since that date, the succeeding surveys showing a fairly uniform rate of movement of 100 feet per year.

The depths on the bar range from 18 to 22 feet (5.5 to 6.7 m). As the depths on the crest of the bar are subject to frequent change, local knowledge is required to carry the best water, which was 19 feet (5.8 m) in 1931. With the aid of the chart, vessels of about 15-foot (4.5 m) draft, with a rising tide and a smooth sea, should have no difficulty in entering during daylight by following the buoys. *Port Royal Sound Entrance Lighted Whistle Buoy PR*, the channel buoys, and the chart are the guides. The boiler of a wreck shown on the chart nearly 5 miles southeastward of Bay Point, is a permanent mark and can be used for cross bearings. The buoys are moved to indicate the best water, the buoyed channel should be followed across the bar.

CALIBOGUE SOUND

(Chart 571)

The entrance to this sound lies 11 miles southwestward of Port Royal Sound entrance and 5 miles northward of Tybee Lighthouse; it is obstructed by shifting shoals through which there are several unmarked crooked channels. From sea the best way of entering the sound is from Tybee Roads, and the depth that can be taken over the bar at low water is about 10 feet (3.0 m).

The **Intracoastal Waterway** affords a deeper passage to the sea via Skull Creek and Port Royal Sound. The controlling depth is 17 feet (5.2 m). Sailing vessels loaded to 16½ feet (5.0 m) were formerly towed from Calibogue Sound and its tributary waters through this passage.

A swash channel close to Braddock Point, at the southwest end of Hilton Head Island, has a depth of 12 feet (3.6 m) at low water, but it is unmarked and used only by local fishermen. Above the bar the depths are ample. These waters are a part of the **Intracoastal Waterway** from Charleston to Savannah and otherwise are of little importance.

Cooper River empties into the sound from westward about 2¼ miles above the entrance. This river is only important as a part of the **Intracoastal Waterway** to Savannah which leads through Ramshorn Creek from Cooper River.

May River, which empties into the sound from westward about 5½ miles above the entrance, is the approach to the village of **Bluffton**, situated about 7 miles above its mouth. A draft of 13 feet (4.0 m) can be carried to the town at low water by exercising care in a changing channel. Boats land at the municipal wharf. A local freight and passenger steamer operating between Savannah and Beaufort

stops at Bluffton and frequently passes through **Bull Creek** en route to Cooper River. The tides meet in Bull Creek, forming flats over which there is about 2 feet (0.6 m) at mean low water. Gasoline and some supplies can be obtained at Bluffton. The river above the town is of no importance.

Mackay Creek enters the sound from northward at its junction with Skull Creek and forms an unused and unlighted route to Port Royal Sound.

Skull Creek forms the section of the **Intracoastal Waterway** between Calibogue and Port Royal Sounds.

Broad Creek enters Calibogue Sound from the eastward and runs 6 miles into **Hilton Head Island**. The creek is of no importance. A depth of 11 feet (3.4 m) can be carried into the creek. Hilton Head Island is privately owned.

Daufuskie Island lies between Calibogue Sound and New River, which empties into Tybee Roads. The island is privately owned.

New River is navigable for a distance of about 10 miles above **Ramshorn Creek**. The **Intracoastal Waterway** passes through Ramshorn Creek from the Cooper River and through New River.

Wright River has no importance above Fields Cut; the section between **Fields Cut** and **Walls Cut** forming part of the **Intracoastal Waterway.**

Directions.—From Tybee Roads steer 321° true (NW. ½ N. mag.) on the Bloody Point range for about ⅞ mile past *Bloody Point Channel Lighted Bell Buoy 13;* or, coming down Savannah River, pass about ⅜ mile southward and eastward of *Bloody Point Spit Buoy 1* (black can).

Then steer 357 true (N. ¼ W. mag.) into the sound.

10. TYBEE ROADS ENTRANCE TO SAVANNAH

TYBEE ROADS AND SAVANNAH RIVER

(Chart 440)

Tybee Roads is the name applied to an anchorage surrounded by the shoals which lie off the entrance to Calibogue Sound and Savannah River, eastward of the northeastern end of Tybee Island. This anchorage can be entered either in the daytime or at night; its general depth is 19 to 24 feet (5.8 to 7.3 m), and the shoals assist to break the sea from any direction. There are two good channels leading across the bar off the roads—the North Slue Channel with 14 feet (4.3 m) and the Main Channel with 29½ feet (9.0 m). Both of these channels are marked by buoys, and the Main Channel by a number of ranges which are easily followed. The main channel over the bar is being improved by dredging.

Savannah Lightship, Lat. 31°57′ N., Long. 80°40′ W., is moored in about 8 fathoms (14.6 m) about 10.5 miles 117¼° true (SE. by E. ½ E. mag.) from Tybee Lighthouse on the prolongation of the Tybee range line. The vessel has a red hull with "Savannah" painted on each side; two masts with black cylindrical grating at each masthead. The light is group flashing white showing two flashes every 15 seconds (flash 3 seconds, eclipse 3 seconds, flash 3 seconds, eclipse 6 seconds) shown from an elevation of 45 feet (13.7 m) and visible

12 miles. A fixed riding light on the forestay indicates the heading of the vessel.

The fog signal is a steam typhon, blast 2 seconds, silent interval 18 seconds. If the whistle is disabled, a bell will be struck by hand—a group of 2 strokes every 20 seconds.

A radiobeacon is installed on the lightship.

Tybee Lighthouse, lat. 32°01′19″ N., long. 80°50′45″ W., on the north end of Tybee Island, is an octagonal brick tower, lower 50 feet (15.2 m) black, middle part white, upper part black. The light is fixed white, 144 feet (44 m) above the water, and visible 18 miles. It forms the rear object of Tybee range.

Savannah River forms the boundary between the States of South Carolina and Georgia and is navigable during the greater part of the year for vessels of 5-foot (1.5 m) draft to the city of **Augusta**, a distance of about 176 miles above Savannah. The dredging of a channel with a project depth of 6 feet (1.8 m) is now underway. At ordinary summer low water this draft is reduced to 3 feet (0.9 m). Flatboats can be taken up the river about 3 miles farther. There is a dam 8 miles above Augusta; pole boats go from Augusta to the river above the dam through a canal, and the river is navigable for this class of boats from the dam to **Petersburg**, a distance of 43 miles. Between Savannah and Augusta there are numerous landings, but no towns or villages of importance; several bridges, with draws about 60 feet wide, cross the river below Augusta.

The existing channel improvement project provides for a channel 30 feet (9.1 m) deep with a general width of 500 feet from the 30-foot contour in the ocean to the quarantine station, 10.2 miles; thence 26 feet (7.9 m) deep with a general width of 400 feet to the Seaboard Air Line Railway bridge, 16 miles; thence 26 feet (7.9 m) deep and 300 feet wide to the foot of Kings Island, 1.3 miles; and thence 21 feet (6.4 m) deep and 200 feet wide with necessary regulating works to the vicinity of the Savannah Creosoting Co., 2.1 miles, a total length of 29.6 miles; for widening the channel to 600 feet at West Broad and Barnard Streets; for an anchorage basin opposite Fort Oglethorpe by widening the 26-foot (7.9 m) channel to 900 feet and installing mooring dolphins.

Dredging operations to maintain the project depth are carried on continuously, and the latest reports on channel depths are given from time to time in the Notice to Mariners. In January 1936 the controlling depths in the Savannah River were as follows:

Sea to quarantine station	30 feet (9.1 m)
Quarantine to foot of Kings Island	26 feet (7.9 m)
Foot of Kings Island to Creosoting Works	22 feet (6.7 m)

Anchorages.—The usual anchorage for vessels waiting for a favorable tide to go up the river is in Tybee Roads, about 2 miles eastward of Tybee Lighthouse, or outside the bar near *Tybee Lighted Whistle Buoy T.* The holding ground is good at both anchorages, but 22 feet (6.7 m) is about the greatest depth available in the roads. Vessels rarely anchor in the river, as there is no room for large vessels to swing.

In case of necessity there is a small anchorage off Fort Jackson (Fort Oglethorpe), about 3 miles below the city. This basin has been dredged to 900 feet in width; a set of mooring dolphins has

also been installed on the south side of the channel in the same locality. These dolphins were in good condition in 1935.

Tides.—For tidal data at Savannah River entrance (Tybee Lighthouse), see the tide tables for the Atlantic Ocean, published annually in advance by the Coast and Geodetic Survey, in which the tides are predicted for every day of the current year. On the bar high and low waters occur about 30 minutes before high and low waters, respectively, at Tybee Lighthouse. Daily predicted tides for Savannah are also included in the Atlantic Ocean Tide Tables. The mean durations of rise and fall of the tide are 6 hours 5 minutes and 6 hours 20 minutes at Tybee Lighthouse, and 5 hours 40 minutes and 6 hours 45 minutes at Savannah.

The mean rise and fall of tides at Tybee Lighthouse is 6.8 feet (2.1 m) and at Savannah 7.5 feet (2.3 m). At Purysburg, 20 miles above Savannah, the mean rise and fall of tides is a little less than 1 foot (0.3 m); when the river is low the tides are felt possibly 7 miles above Purysburg, while during heavy freshets the rise and fall at Cross Tides, 3½ miles above Savannah, is 2 feet (0.6 m) or less.

Currents.—The mean velocity of the strength of ebb current from the jetties at the entrance to Savannah is from 2½ to 3 knots. The flood current has a velocity at strength of from 1½ to 2 knots. From the entrance nearly to Savannah slack water occurs about one hour after high and low water at Savannah. The time of slack water is considerably influenced by the wind and freshets. For the predicted times of slack water and the times and velocities of strength of flood and ebb at the entrance to Savannah River, see the Current Tables, Atlantic Coast, published annually in advance by the Coast and Geodetic Survey.

The currents set in the direction of the channel except at the entrance near Tybee Lighthouse, where the flood sets northwestward across the channel. Between the jetties the flood sets 260° true.

Freshets occasionally occur in the spring, but do not endanger the shipping at the wharves at Savannah.

DIRECTIONS, TYBEE ROADS AND SAVANNAH RIVER

From northward.—From a position about 2 miles southeastward of *Charleston Lighted Whistle Buoy C* make good a course of 227½° true (SW. ¼ W. mag.) for 65½ miles passing about 2 miles southeastward of *Hunting Island Lighted Whistle Buoy 6 HI*, to a position about 2 miles southeastward of Savannah Lightship.

Shallow-draft boats from the northward (drawing not over 11 feet (3.4 m)), with a smooth sea and in daylight, can enter Tybee Roads through the **North Slue Channel.** From a position about 2 miles southeastward of *Hunting Island Lighted Whistle Buoy 6 HI* make good a 248° true (WSW. mag.) course for 25.9 miles to a position 200 yards southeastward of *North Slue Channel Outer Buoy* (black and white vertically striped can), from which Tybee Light bears 270° true (W. mag.), distant 4 miles. On this course care must be taken to pass at least ¼ mile southward of the black can buoy off the southeasterly end of Gaskin Banks, and Tybee Lighthouse should be made and kept on the starboard bow. From the perpendicularly striped can buoy steer for Tybee Lighthouse, pass about

200 yards southward of nun buoy no. 2, and then head up for *Bloody Point Channel Lighted Bell Buoy 13.*

From southward deep-draft vessels should not shoal the water to less than 6 to 7 fathoms (11.0 to 12.8 m). From a position about 2 miles southeast of *Brunswick Lighted Whistle Buoy 2 B* make good a 24° true (NNE. ⅛ E. mag.) course for 62 miles, passing about 2 miles southeastward of *Sapelo Lighted Whistle Buoy 2 S*, to a position about 2 miles southeast of Savannah Lightship. Or, in clear weather, when the lightship is sighted, the course can be shaped to pass as much as 3 miles inside.

Vessels should expect an inshore set with the tide flooding. See caution, page 153. The channel from sea to Savannah is a dredged cut 400 to 500 feet wide, the tidal currents have considerable velocity, and strangers are advised to take a pilot. The ranges mentioned in the following directions mark the axis of the cut; in addition to the ranges, the channel is buoyed.

Courses and distances, Savannah Lightship to Savannah

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. **Savannah Lightship,** bearing SE. by E. ⅝ E., distant 1 mile. Steer Tybee Range (front light Fl. W., rear light F. W.) ahead; pass 100 yards N. of Tybee Lighted Whistle Buoy T. (short-long Fl. W.), 125 yards north of channel buoys 1 and 3:	°	*Points*	*Nautical miles*
Direct	297	NW. by W. ⅝ W.	5.5
Reverse	*117*	*SE. by E. ⅝ E.*	*5.5*
2. **Bloody Point Channel Lighted Bell Buoy 2** (Fl. R.), bearing NE., dist. 150 yards. Steer Bloody Point Range (front light Fl. W., rear light Occ. W.) ahead; pass 175 yards NE. ½ E of channel buoys 7, 9, and 11:			
Direct	321	NW. ½ N	2.8
Reverse	*141*	*SE. ½ S*	*2.8*
3. **Bloody Point Channel Lighted Bell Buoy 13** (Fl. W.), bearing S., dist. 200 yards. Steer Jones Island Range (front light Fl. W., rear light Occ. W.) ahead; pass 200 yards north of channel buoys 1 and 3:			
Direct	285	WNW. ⅝ W	1.45
Reverse	*105*	*ESE. ⅝ E*	*1.45*
4. **Second Cut Lighted Buoy 3A** (Fl. G.), bearing S., dist. 100 yards. Steer Tybee Knoll Cut Range (front lights F. W. rear light Occ. W.) ahead; pass 150 yards north of channel buoys 5 and 7 and 125 yards south of channel buoy 4:			
Direct	264	W. ½ S	2.2
Reverse	*84*	*E. ½ N*	*2.2*

Courses and distances, Savannah Lightship to Savannah—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
5. **Oyster Beds Shoal Lighted Buoy 6** (Fl. R.), bearing N., dist. 150 yards. Steer New Channel Range (front light F. G., rear light Occ. G.) ahead; pass about 75 yards north of Quarantine wharf Lt. (F. G.):			
Direct	281	W. by N	1. 4
Reverse	*101*	*E. by S*	*1. 4*
6. **Long Island Crossing Front Range Light** (Fl. W.), bearing S., dist. 300 yards. Haul gradually onto Long Island Crossing Range; passing south and west of Horseshoe Lighted Buoy 8 (Fl. W.):			
Direct	------	Various	. 3
Reverse	------	*Various*	*. 3*
7. **New Channel Range Front Light** (Fl. G.), bearing SW., dist. 300 yards. Steer Long Island Crossing Range (front light F. W., rear light Occ. W.) astern; passing about 75 yards southwest of buoys 10 and 12:			
Direct	319	NW. ⅜ N	2. 2
Reverse	*139*	*SE. ⅜ S*	*2. 2*
8. **Lower Flats Range Front Light** (Fl. R.), bearing N., dist. 200 yards. Haul gradually westward onto Lower Flats Range astern, passing about 100 yards northeast of Pumpkin Shoal Lighted Buoy 9 (Fl. G.):			
Direct	------	Various	. 3
Reverse	------	*Various*	*. 3*
9. **Lower Flats Range Front Light** (Fl. R.), bearing E. by S., dist. 500 yards; steer Lower Flats Range (front light Fl. R., rear light Occ. R.) astern:			
Direct	280	W. ⅞ N	. 7
Reverse	*100*	*E. ⅞ S*	*. 7*
10. **Elba Island Light** (Fl. G.), bearing W., dist. 250 yards. Pass 120 yards northeast of Elba Island Lt. (Fl. G.) and Elba Island Upper Lt. (Fl. G.):			
Direct	296	NW. by W. ¾ W	. 5
Reverse	*116*	*SE by E. ¾ E*	*. 5*
11. **Elba Island Upper Light** (Fl. G.), bearing S., dist. 150 yards. Haul gradually northward until on Upper Flats Range astern:			
Direct	------	Various	. 5
Reverse	------	*Various*	*. 5*
12. **Upper Flats Front Range Light** (Fl. W.), bearing SSE., dist. 500 yards. Steer Upper Flats Range (front light Fl. W., rear light Occ. W.) astern:			
Direct	342	N. by W. ⅝ W	. 5
Reverse	*162*	*S. by E. ⅝ E*	*. 5*

Courses and distances, Savannah Lightship to Savannah—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
13. **North Elba Island Training Wall Light** (Fl. R.), bearing E., dist. 100 yards. Haul gradually westward keeping 100 yards off Barnwell Place (Oglethorpe Range Rear) Lt. (Occ. R.) and the same distance from the bank until nearing Proctor Place Lt. (Fl. R.):	°	*Points*	*Nautical miles*
Direct		Various	1. 2
Reverse		*Various*	*1. 2*
14. **Proctor Place Light** (Fl. R.), bearing N. by W., dist. 125 yards:			
Direct	236	SW. by W	. 3
Reverse	*56*	*NE. by E*	*. 3*
15. **Elba Island Flats Light 11** (Fl. G.), bearing ENE. ½ E., dist. 750 yards. Steer Fort Jackson Range (front light Fl. G., rear light Occ. G.) ahead:			
Direct	210	SSW. ⅝ W	. 6
Reverse	*30*	*NNE. ⅝ E*	*. 6*
16. **Barnwell Island Flats Lighted Buoy 14** (Fl. R.), bearing W., dist. 200 yards. Steer Oglethorpe Range (front light Fl. G., rear light F. R.) astern; pass 75 yards north of Fort Oglethorpe Lt. (Fl. G.):			
Direct	245	SW. by W. ¾ W	1. 1
Reverse	*65*	*NE. by E. ¾ E*	*1. 1*
17. **Fig Island Jetty Light** (Fl. R.), bearing N., dist., 100 yards. Steer midchannel courses until up to the wharves on the South bank; then follow the wharves at a distance of 80 to 100 yards:			
Direct		Various	4. 5
Reverse		*Various*	*4. 5*
18. **Seaboard Air Line drawbridge.**			

PORT OF SAVANNAH

Savannah, population 85,024 in 1930, is on the south bank of the river about 15 miles above the entrance. It is the second largest city and chief port of the State of Georgia, and one of the important southern ports for the shipment of cotton, lumber, naval stores, sugar, chemicals, and oil. It is the chief distributing point for supplies to the surrounding country, and has considerable coastwise and foreign trade. There are excellent hotel accommodations in the city.

Quarantine.—The national quarantine station and boarding station is on the south side of the channel west of Cockspur Island.

Pilots.—A pilot boat will be found outside the bar. The regular station for the pilot boat is between the lightship and the sea buoy. Pilotage is compulsory for certain vessels.

Pilotage.—The following rates for pilotage were prescribed on January 16, 1923.

Rates for pilotage

Draft (feet and under)	Bar to Cockspur	Cockspur to Savannah	Total	Draft (feet and under)	Bar to Cockspur	Cockspur to Savannah	Total
6	$9. 00	$6. 00	$15. 00	20½	$85. 00	$40. 00	$125.00
7	9. 00	8. 50	17. 50	21	88. 00	42. 00	130. 00
8	11. 00	9. 00	20. 00	21½	90. 00	45. 00	135. 00
9	13. 00	9. 50	22. 50	22	93. 00	47. 00	140. 00
10	15. 00	10. 00	25. 00	22½	95. 00	50. 00	145. 00
10½	17. 00	10. 50	27. 50	23	98. 00	52. 00	150. 00
11	19. 00	11. 00	30. 00	23½	100. 00	55. 00	155. 00
11½	21. 00	14. 00	35. 00	24	103. 00	57. 00	160. 00
12	23. 00	17. 00	40. 00	24½	105. 00	60. 00	165. 00
12½	25. 00	20. 00	45. 00	25	108. 00	62. 00	170. 00
13	30. 00	20. 00	50. 00	25½	110. 00	65. 00	175. 00
13½	35. 00	20. 00	55. 00	26	113. 00	67. 00	180. 00
14	40. 00	20. 00	60. 00	26½	115. 00	70. 00	185. 00
14½	45. 00	20. 00	65. 00	27	118. 00	72. 00	190. 00
15	48. 00	22. 00	70. 00	27½	120. 00	75. 00	195. 00
15½	50. 00	25. 00	75. 00	28	123. 00	77. 00	200. 00
16	55. 00	25. 00	80. 00	28½	125. 00	80. 00	205. 00
16½	58. 00	27. 00	85. 00	29	128. 00	82. 00	210. 00
17	60. 00	30. 00	90. 00	29½	130. 00	85. 00	215. 00
17½	65. 00	30. 00	95. 00	30	133. 00	87. 00	220. 00
18	65. 00	35. 00	100. 00	30½	135. 00	90. 00	225. 00
18½	70. 00	35. 00	105. 00	31	137. 00	93. 00	230. 00
19	75. 00	35. 00	110. 00	31½	140. 00	95. 00	235. 00
19½	78. 00	37. 00	115. 00	32	143. 00	97. 00	240. 00
20	80. 00	40. 00	120. 00				

Vessels calling for bunkers or repairs pay one-half the above rate.
Detention of pilots per day, $4.32.

Move

Draft	Tybee to Savannah or Savannah to Tybee	Venus Point to Savannah or Savannah to Venus Point	Four-Mile Point to Savannah or Savannah to Four-Mile Point	Five Fathom to Savannah or Savannah to Five Fathom
8 feet	$8. 00	$8. 00	$6. 00	$4. 00
9 feet	10. 00	10. 00	8. 00	6. 00
10 feet	10. 00	10. 00	8. 00	6. 00
11 feet	11. 00	11. 00	10. 00	8. 00
12 feet	11. 00	11. 00	10. 00	8. 00
13 feet	12. 00	11. 00	10. 00	8. 00
14 feet	14. 00	14. 00	12. 00	10. 00
15 feet	17. 00	15. 00	13. 00	10. 00
16 feet and upward	18. 00	16. 00	14. 00	12. 00

Harbor regulations.—1. Every pilot, when he has brought any ship or vessel to anchor, is required to moor such ship or vessel, or to give proper directions for the mooring of the same, and for her safe riding at such mooring. He shall also make known to the captain of such vessel the laws requiring lights on board.

2. It shall be the duty of every pilot to inform the masters of vessels of their duty to report to the harbor master's office within 24 hours after arrival at city.

3. Pilots are directed to moor all vessels which stop at Five Fathoms to lighten or discharge, as near the south shore as may be safe, that an open passage may be left to the northward for vessels to pass and repass. No vessel shall discharge or load any of her cargo in the river opposite the city, except at the

wharves. No anchor is allowed in the river when the vessel is made fast to the wharf.

4. All masters of vessels, as soon as they come to anchor, shall rig in their jig boom, spanker boom, and main boom; and all vessels shall brace their lower and top sail yards on starboard braces, take in the boomkins and duvits, lay their spit-sail yards fore and aft, rig in their martingale, take in all boom irons, and cockbill their anchors. These regulations must be observed while lying at the wharf, or at anchor in any part of the river. The master of any vessel or his representatives, refusing to move his vessel, when ordered to do so by the harbor master or deputy, the vessel shall be moved, if necessary, with tug or tugs, and proper crew employed, at expense of said vessel.

5. Master or consignee of any vessel wishing to move shall give the harbor master sufficient notice to enable him to give her a clear berth. The harbor master must be the judge of the time required.

6. No vessel shall be moved, after being placed at the wharf, without permission of the harbor master.

7. No vessel, other than regular packets, arriving at the city, shall be docked without permission from the harbor master.

8. All vessels, except regular packets, in ballast, waiting for freight, light or occasionally taking in, discharging, or retailing a cargo at any wharf shall give the inside berth to a loaded vessel that wants to discharge forthwith; and every such vessel shall likewise give inside berth to a vessel that wants to take on her cargo immediately. Any vessel, except regular packets, taking in a cargo at any wharf shall give the inside berth to a loaded vessel if, at the time of application for such berth, there be no other vacant or equally suitable berth for such loaded vessel.

9. Every vessel hauling past or lying alongside and making fast to another vessel shall put out, in a proper manner, good and sufficient fenders, and keep the same so placed as to prevent injury to the vessel she may be alongside of and shall likewise so place her mooring as to prevent injury to said vessel, and if discharging or taking in a cargo athwart another vessel's deck, she must also keep her plank or staging so fixed as not to cause injury.

10. Masters of vessels shall not permit ballast, rubbish, or dirt of any kind to be thrown into the river or harbor. All ballast or coal shall be thrown 10 feet back, clear of the heads of the wharves; a heavy sail or tarpaulin must be put between the vessel and the wharf, extending under and 5 feet on each side of the stage, to prevent any from falling into the river. The sweepings from the deck, or ashes from the caboose, or rubbish of any kind must be put upon the wharf and carted away.

11. No vessel, while lying alongside the wharf or another vessel, shall be smoked for the purpose of destroying rats, but must first be hauled in the stream and kept constantly afloat so as to be easily removed in case of taking fire.

12. No tar, pitch, or turpentine shall be boiled on any vessel's deck, or within 60 yards of any vessel or warehouse. Notice in all cases to be given to the harbor master.

13. No raft of timber or lumber shall be broken up in the front river below low-water mark, except that rafts of oak or cypress may be broken up on north side of river, in accordance with provisions of ordinance passed in council March 25, 1885. No raft shall be permitted to lie more than 48 hours afloat in the river, nor shall any stave, wood, or shingle raft be landed at the heads of the wharves.

14. No vessel lying at any of the wharves on the southern side of the river between Habersham's Mill and the eastern extremity of the city shall be permitted to take on board any timber or lumber from rafts alongside, unless the owner or lessee of the wharf at which the vessel lies shall consent thereto and procure the consent of the owner or lessee of the adjacent wharves, which consent shall be in writing and filed with harbor master. In cases where it would not be safe to remove empty vessels the mayor will give permission to load a few sticks of timber at wharf, said sticks to be secured by chains and dogs after the raft shall have been broken up.

15. No person shall encumber the wharves with cotton, coal, bricks, lumber, stone, or other heavy articles, so as to prevent the use of said wharf to vessels wishing to load or discharge cargoes.

16. Not more than two vessels of 100 tons or more register shall be allowed to lay alongside at any wharf in the city so long as there shall be another wharf

vacant, or with only one vessel thereat, except under special permit from the harbor master, approved by the mayor.

17. No vessel or boat lying alongside of any other vessel or wharf shall have a fire in the caboose, or any other place on or under deck, of said vessel or boat, except in an iron caboose, and such caboose or other fireplace be well and safely covered and surrounded with a good and sufficient caboose house, hut, or other covering or inclosure.

18. All vessels overlying the city wharves and docks must pay proportional wharfage. No rafts shall be kept across or in them for the purpose of loading, except by permission.

19. No shingle or sand ballast or rubbish of any description shall be landed without permission of the harbor master.

20. Any vessel will be admitted to a berth or be allowed to change from one berth to another on application to the harbor master.

21. No master or other person having charge of any ship or vessel shall refuse or neglect to obey the directions of the harbor master, or his assistant, in any matters within his or their authority, or shall molest, resist, or oppose the harbor master, or his assistant, in the execution of any of the duties of his or their office.

22. The master of any vessel laying at anchor in any port of the river at nighttime shall cause a good and sufficient light to be shown in some part of the rigging of such vessel, at least 20 feet above her deck, which light shall be kept burning during all hours of the night.

23. Every vessel must always have on board a ship keeper, or other person capable to take charge of her.

24. In case of any dispute or difference of opinion arising between or amongst masters of vessels, or others concerned under the foregoing harbor regulations, the same should be settled by the arbitration of the harbor master, on the application to him of those interested.

No launch, batteau, skiff, sloop, schooner, or other vessel shall anchor or moor to any buoy in the Savannah River between the Seabord Air Line bridge and Fort Oglethorpe or Jackson, at a distance of more than 75 feet from the north harbor line of said river.

Any person violating any of the regulations contained in the foregoing sections, upon conviction thereof in the police court, shall be fined in a sum not exceeding $100, or be imprisoned not more than 30 days, either or both, in the discretion of the officer presiding in said court.

Ordinance to lessen danger from fire.—That hereafter it shall be the duty of every owner, agent, master, or captain of any vessel, boat, tug, or craft propelled in whole or in part by steam; or on which any steam engine or steam boiler is, or is used, immediately upon the arrival of such vessel at any wharf, dock, or pier within the port of Savannah, to cover all funnels and smokestacks securely with a first-class spark arrester or arresters.

That it shall be the duty of every person owning or operating any steam locomotive, steam engine, donkey engine, or stationary engine on or about the wharves, docks, or piers of the city of Savannah, or on or about any yard or warehouse where any cotton or naval stores are stored in the city of Savannah, to cover the smokestack of each and every such steam locomotive, steam engine, donkey engine, or stationary engine securely with a first-class spark arrester.

That it shall be the duty of every owner, agent, master, or captain of any vessel, boat, tug, or craft, propelled in whole or in part by steam, immediately upon its arrival in this port, to couple its fire hose and have the same ready for immediate use at all times while in this port; provided said vessel, boat, tug, or craft is loading or discharging a cargo of cotton or naval stores, and sufficient steam shall be kept up night and day on the donkey engine or on one of the main boilers to enable a full stream of water to be turned into any compartment of such boat, tug, vessel, or craft at any time; and in the event that such vessel, boat, tug, or craft shall not be provided with sufficient hose to reach each and every hatch of said vessel, boat, tug, or craft, then it shall be the duty of the owner, agent, master, or captain thereof to immediately supply said vessel, boat, tug, or craft with sufficient hose so to do.

That it shall be the duty of every agent, owner, master, or captain of any vessel, while loading or discharging a vessel in this port, to protect or have protected all hatch combings so that the cargo of cotton or naval stores so loaded or unloaded shall not come in contact with the combings.

That it shall be unlawful for any person to smoke any pipe, cigar, or cigarette on the deck or in the hold of any vessel while loading or unloading at this port.

That it shall be unlawful for any person to have, carry, take, or use any light or lantern in the hold or holds of any vessel loading or unloading in this port, except such light be a closed and locked lantern.

That it shall not be lawful while any vessel is engaged in loading cotton or naval stores, or before her load is complete, in this port, for any person to paint in or about any part of said hold of said vessel.

That it shall be the duty of every master of any vessel while in this port, and while loading and unloading, to see that as soon as work is stopped for the day all hatches are put on and covered with tarpaulin.

That it shall be the duty of every master, captain, agent, or owner of every vessel of every sort and description, propelled in whole or in part by steam, while loading or unloading cotton or naval stores in this port, to place and keep at or near each hatch, a barrel filled with water, to be used only in case of fire, to which said barrel shall be attached two buckets, to be used only in case of fire.

That any person violating any provision of this ordinance, shall, upon conviction before the police court of the city of Savannah, be subject to a fine not to exceed $100 and imprisonment not to exceed 30 days, either or both, in the discretion of the court.

All persons engaged in lightering or otherwise transporting cotton, hay, straw, or other inflammable merchandise (naval stores excepted) on the Savannah River, or other waters within the limits over which the said mayor and aldermen of the city of Savannah have jurisdiction, be and they are hereby required to cover the same, while on lighters or other crafts, with tarpaulins or other more permanent and substantial materials, and that each failure to do so shall be considered a violation of this ordinance, and be punished as hereinafter provided.

It shall be unlawful for any person to make or to use matches in any way in the holds of vessels of any description, or on the decks of the same during the time said vessels may be taking in or unloading cargoes of cotton, naval stores, hay, oil, or other inflammable merchandise.

Ordinance to prohibit discharge of refuse oil.—It is unlawful for any person, firm, or corporation, or master of any ship, to discharge, throw, or dump refuse oil into the Savannah River, in the Savannah Harbor, or into any of the streams flowing therein, or into any of the docks, or alongside any of the piers, or along the shores or banks of said river, refuse oil of any character.

Any person, firm, or corporation, or master of any vessel, violating the provisions of this ordinance shall, upon conviction before the police court of the city of Savannah, be fined in sum not more than $100 or to be imprisoned not more than 30 days, either or both, or any part of either or both, in the discretion of the court.

Speed of vessels.—No steamer shall, while passing along the line of the wharves of this city, exceed in speed 4 miles an hour; and where two or more vessels are moored abreast of any of said wharves the steamer passing will stop her engines and turn "over slowly", using every precaution to avoid unnecessary suction until the vessels in her immediate vicinity are passed by. In passing near the dredge and dredge flats employed at any point on the river between the western limits of the city and Tybee, steamers must be slowed down and, where necessary, stopped and worked as above specified until the dredge or flats are passed.

No steamer, while passing the line of quarantine wharves opposite the eastern end of Long Island, shall exceed a speed of 5 miles per hour.

Harbor dues.—By each transient brig or schooner, $4; by each transient ship or bark, $6; by each transient steamship, $15; by each coastwise steamship running regularly to this port, $6 per month. By each bark, barkentine, brig, schooner, or sea-going barge engaged in the coastwise trade, $4; each transient tug engaged in towing, $8, payable not more than twice in every year; by each sailing vessel or steamer plying inland measuring 40 feet or more, 2 cents per foot over-all measurements, payable quarterly in advance.

Terminal facilities.—There are 69 piers and wharves at Savannah with sufficient water at them for vessels that are brought to the city. Practically all of the piers and wharves are of wood pile construction. Many are equipped with mechanical unloading devices for handling

bulk cargo; all have direct connection with the railways, and all but those on Hutchinson Island have street or highway connections. There are ample storage facilities available for cotton, cotton products, fertilizer materials, and naval stores.

Supplies.—Coal, either anthracite or bituminous, in large quantities, or fuel oil can be had at the wharves at Savannah or from lighters towed down to vessels at the roads. Fresh water is usually brought to shipping by tugs; the river water at Savannah is fresh at any stage of the tide. Provisions and ship chandler's stores can be had in the city or are sent down to the roads in tugs.

Repairs.—The facilities for repairs to the machinery of steamers are good. There are several marine railways; the largest has a deadweight lifting capacity of 1,200 tons and will dock a vessel 225 feet long.

Towboats will come out over the bar to vessels making signal. With a fair wind, sailing vessels usually sail into the roads, but a towboat is necessary for large sailing vessels between the roads and Savannah.

Communications.—The port is reached by four trunk lines and is also served by a terminal railway company and two rail carriers operating to local points. The trunk lines are the Central of Georgia Railway, the Seaboard Air Line Railway, the Atlantic Coast Line Railroad, and the Southern Railway System.

There is regular coastwise steamship service, and steamship sailings to foreign and Pacific coast ports.

Aviation fields.—There is a municipal airport situated about 5 miles from the center of the city. The present landing field has a width of 1,500 feet and a length of 3,312 feet. Gasoline and oil are available at the field.

A branch hydrographic office of the Navy Department is located at the customhouse; this office is supplied with the latest information and publications affecting navigation for the consultation of mariners.

Storm warnings are displayed at Savannah and from a signal tower near Tybee Lighthouse.

United States Public Health Service.—At Savannah there is a marine hospital.

11. TYBEE ROADS TO ST. JOHNS RIVER

COAST FROM TYBEE ROADS TO WASSAW ROAD

(Chart 440)

This section of the coast is about 6½ miles in extent and is formed by the shore of Tybee Island, which lies in a northeasterly and southwesterly direction.

This island has a breadth at its widest part of 3¼ miles, is mostly low and marshy, but has many wooded hummocks with numerous creeks winding among them. On the eastern shore several large creeks come into the sea, but they are of little importance, as their mouths are obstructed by shoals, with crooked channels of 2 or 3 feet (0.6 to 0.9 m) at low water through them. **Tybee Beach** is a sum-

mer resort south of Tybee Lighthouse, and the houses show up well from seaward.

Tybee Creek, with **Lazaretto Creek**, is used by small boats as an inside approach to Tybee Beach.

The southeast part of the island, separated from the main body by a stretch of marsh, is called **Petit Chou Island**, and is distinguishable by a large and heavily wooded hummock which marks the northern point of the entrance to Wassaw Sound. Dangerous shoals make off from the shore of Tybee Island to a distance of 4½ miles.

WASSAW SOUND

(Chart 440)

The entrance to this sound lies 8 miles southwestward of Tybee Lighthouse. Shoals extend offshore a distance of 3½ to 4 miles from the entrance, forming a shifting bar through which there is a channel with a depth of about 14 feet (4.3 m). After crossing the bar there is a good channel with 3 to 7 fathoms (5.5 to 12.8 m) which leads along the southern and western part of the sound and for a distance of 6 miles up Wilmington River. The sound is for the most part shallow, but the channels into its principal tributaries will permit any draft that can be taken over the bar. A considerable number of fishing boats use this entrance, and yachts too deep for the Intracoastal Waterway can enter here and go up the Wilmington River to Plantation Harbor.

Tybee River empties into the sound from northward; it is about 7 miles in length to its junction with **St. Augustine** and **Turners Creeks**; by the former it is connected with Savannah River about 5 miles below the city of Savannah; a depth of 9 feet (2.7 m) can be taken through to Savannah River. The entrance to Tybee River is obstructed by a shoal in Wassaw Sound, over which a depth of 10 feet (3.0 m) can be taken into the river. About 2 miles above the mouth of Tybee River it is entered from southeastward by Lazaretto Creek; this creek also connects the river with Savannah River near its mouth and forms a passage with a reported depth of about 7 feet (2.1 m). **Turners Creek** connects Tybee River with Wilmington River and has a depth of 7 feet (2.1 m).

Wilmington River empties into Wassaw Sound from northwestward. It has a northwesterly direction for 8 miles to the village of **Thunderbolt** and then turns northward for about 4 miles and, joining **St. Augustine Creek**, connects with **Savannah River**. The river is important only as being a part of the **Intracoastal Waterway** from Savannah to Fernandina. A depth of 7.2 feet (2.2 m) can be taken through to Savannah River.

Thunderbolt is a small village and pleasure resort on the west bank of Wilmington River. Yachts and small craft usually stop here rather than at Savannah and thus avoid the pounding against the wharves caused by the surge from vessels passing in the Savannah River. There is good anchorage in the river, and small wharves with depths of 4 to 8 feet (1.2 to 2.4 m) at low tide. An electric car line connects with Savannah. Gasoline, Diesel oil, fresh water, and some provisions can be obtained here. There are boat-building and repair

shops and marine railways of a capacity of about 60 tons and a draft of about 4 feet (1.2 m). The mean range of tide is about 8 feet (2.4 m).

Plantation Harbor is the name given to a part of the Wilmington River between the mouths of Turners Creek and Skidaway River. A hotel and yacht club are open to the public at that place. There is good anchorage in the river and good hotel accommodations ashore, with highway connections with Savannah, about 9 miles distant.

Skidaway River empties into Wilmington River from southwestward about 2 miles southeastward of Thunderbolt and 5¾ miles above Wassaw Sound, and with **Skidaway Narrows** and **Burnside River** is a part of the principal **Intracoastal Waterway** passage between Savannah and Fernandina. In June 1935 the controlling depth was 7.8 feet (2.4 m), obtainable in the narrow channel through Skidaway Narrows. The current runs swiftly in Skidaway Narrows.

Isle of Hope is a pleasure resort on the north bank of Skidaway River. It is connected by electric railway with Savannah. Gasoline and provisions are obtainable, and there are railways for small craft. A suitable anchorage for small boats is near the west shore about ¼ mile below the town. No wharves have greater than 3 feet (0.9 m) of water at low tide.

Romerly Marsh Creek enters the western end of Wassaw Sound at the mouth of Wilmington River and with **Romerly Marshes** and Adams Creek forms an inland passage to **Vernon River.** This passage is only good for shallow-draft boats and is practically abandoned. There is another passage, used to some extent, through **Old Romerly Marsh Channel, Parsons Cut, Wassaw Creek,** Odingsell River, and Adams Creek to Vernon River. This passage has shoaled to less than 3 feet (0.9 m) and is also practically abandoned.

Savannah pilots will take vessels into Wassaw Sound.

Currents.—The tidal currents in Wassaw Sound have considerable velocity and must be allowed for. Advantage may be taken of them on the flood to beat in or on the ebb to beat out; but no vessel, however smart working, should attempt to beat against them.

Tides.—The mean rise and fall of the tide varies from about 7 feet (2.1 m) in the sound to 8 feet (2.4 m) up in the rivers.

Directions.—There are no prominent landmarks that can be readily recognized by a stranger when approaching the entrance. Wassaw Island, which forms the southern side of the entrance, is heavily wooded along its seaward side, and presents a level, unbroken appearance, while Tybee Island, on the northern side of the sound, shows lower with scattered wooded hummocks. Tybee Lighthouse, 8 miles northward of Wassaw Sound, shows well from off the bar and is a good mark.

Approaching the entrance, vessels should keep over 5 miles from shore in a depth of over 6 fathoms (11.0 m) until the Sea buoy (black and white vertically striped nun) is sighted. This buoy lies 247° true (WSW. mag.), 11.7 miles from Savannah Lightship, with Tybee Lighthouse bearing 8° true (N. ¾ E. mag.). The channel over the bar is buoyed, and these buoys are moved, if necessary, to mark the best water. In entering, no detailed directions are necessary except to follow the buoys and use the latest charts.

COAST FROM WASSAW SOUND TO OSSABAW SOUND

(Chart 1241)

This formed by the shore of **Wassaw Island**, which lies in a northeasterly and southwesterly direction between the two sounds. It is triangular in shape, having a length of side of 4¾ miles and an extreme breadth of 3⅜ miles in a northwesterly and southeasterly direction. It is for the most part low and marshy, the strip of firm land forming the coast line being only from ¼ to ¾ mile in width. This is heavily wooded and has a broad sand beach backed by sand hills. From this beach dangerous shoals make off to a distance of 4 miles. The marshy portion of the island inside this strip is cut up by numerous creeks, with numberless branches winding among heavily wooded hummocks. The island is separated from the land to the westward by **Romerly Marsh Creek** and the **Odingsell River**.

OSSABAW SOUND

(Chart 573)

Ossabaw Sound, is a broad opening in the coast 15 miles southwestward of Tybee Lighthouse. The greater part of the sound is shallow, but the channels to the two river entrances have a depth sufficient for any vessel that can cross the bar. Shifting shoals extend seaward off the entrance for a distance of 3½ to 5 miles, through which two channels lead into the sound. The North Channel has 13 feet (4.0 m) at low water and leads to the Odingsell and Vernon Rivers. The South Channel has 11 feet (3.4 m) at low water and forms the approach to the Ogeechee River. There are no aids, and the **Intracoastal Waterway**. For detailed description, see Inside pilot.

Vernon River enters Ossabaw Sound from northwestward. **Burnside River** enters Vernon River from northward about 3½ miles above its entrance and with Skidaway Narrows and River is a part of the **Intracoastal Waterway**. For detailed description, see Inside Route Pilot, New York to Key West.

Montgomery is a post village on Vernon River, 1½ miles above Burnside River; it is connected by road with Savannah. **Little Ogeechee River** enters Vernon River from westward about 2 miles above its mouth.

Adams Creek enters Ossabaw Sound from northward about 2¾ miles above its entrance and with Odingsell River, Wassaw Creek, Parsons Cut, and Old Romerly Marsh Channel forms an inland route to Wassaw Sound with a depth of less than 3 feet (0.9 m). Odingsell River enters Ossabaw Sound from northward at the entrance to the sound.

Ogeechee River enters the western part of the sound and is the second largest river on the coast of Georgia. It drains an extensive area, is subject to flood conditions and alters its channel with each succeeding flood. It is navigable for those possessed of local information to the highway bridge approximately 25 miles above the

sound. The **Intracoastal Waterway** leads up this river a distance of 2¾ miles, and thence through **Florida Passage** and **Bear River** to **St. Catherines Sound.**

Pilots.—There are no regular pilots for Ossabaw Sound or its tributaries. Persons competent to pilot vessels can be found at Savannah or Thunderbolt.

Tides.—The mean rise and fall of tides is about 7 feet (2.1 m), decreasing to about 1 foot (0.3 m) at the highway bridge across the Ogeechee River.

The **tidal currents** in the sound have considerable velocity, and allowance must be made for them. The ebb setting out of Ogeechee River is particularly strong.

COAST FROM OSSABAW SOUND TO ST. CATHERINES SOUND

(Chart 573)

The coast line between these sounds is formed by the eastern shore of **Ossabaw Island.** This island lies in a northeasterly and southwesterly direction, having a length of 7⅜ miles and a width of 5½ miles. The eastern half of the island is heavily wooded. The western half is almost entirely marshy and is cut up by numerous creeks that afford access to the higher ground to the eastward. The north end of the island forms the south shore of Ossabaw Sound, into which flows a small stream called **Bradley River,** that penetrates to the center of the island.

The seaward side of the island is unbroken by streams of any size and presents to the view only a white sand beach backed by heavy woods. Dangerous shoals make off from this shore to a distance of nearly 5 miles.

The southwestern point of the island borders on St. Catherines Sound and is well wooded. On the west the island is separated from the marshes of the mainland by Bear River and Florida Passage, connecting streams which afford an inside passage from one sound to the other. From these streams **Queens Bess Creek, Canepatch Creek, Buckhead Creek, Big Tom Creek,** and **Newell Creek** run through the marshes to the wooded portions of the island.

ST. CATHERINES SOUND

(Chart 573)

St. Catherines Sound is about 24 miles southwestward of Tybee Lighthouse and 21 miles northeastward of Sapelo Lighthouse (light now discontinued). The entrance to the sound is over a shifting bar which extends 5 miles offshore. The entrance is marked by *St. Catherines Whistle Buoy St. C* and, with the aid of a chart, it should not be difficult for boats drawing 11 feet (3.4 m) to enter by following closely the buoyed channel. On a clear day the entrance may be recognized, showing the break between the wooded points on its northern and southern sides. Surveys in 1934 show that the points of land on either side of the entrance are wearing away.

There are no towns on the sound. Strangers seldom enter, and, except for light-draft fishing boats, there is little traffic across St.

Catherines Bar. There are no regular pilots, but Savannah pilots will take vessels in over the bar.

The sound is for the most part shallow, but channels with depths of 3 to 5 fathoms (5.5 to 9.1 m) lead from inside the bar into the entrances of its tributaries.

The **Intracoastal Waterway** crosses St. Catherines Sound just inside the entrance and affords passage northward through **Bear River** to **Ossabaw Sound**, and southward through **Walburg Creek** and **Johnsons Creek** to **Sapelo Sound**. The main body of the sound is exposed and becomes quite rough in moderately bad weather. The best anchorage is in Walburg Creek.

Tides.—The mean rise and fall of tides in the sound is about 7 feet (2.1 m), increasing to about 8 feet (2.4 m) at **Belfast** and **Kilkenny Club**. The tidal currents have considerable velocity at the entrance and in the rivers.

Bear River enters St. Catherines Sound from the northwestward just inside the entrance. About 8 miles above its mouth the river joins **Florida Passage**, and this affords passage, with a depth of 9 feet (2.7 m) in 1934, to **Ossabaw Sound**. This route is a section of the **Intracoastal Waterway**. The tidal currents are swift in the lower reaches of Bear River.

A depth of 10 feet (3.0 m) can be taken up Bear River and about 3 miles up **Kilkenny Creek**, its principal tributary. There was formerly a wharf and sawmill at **Kilkenny**, 1¾ miles above the mouth of the creek. There is passage through **Kilkenny Creek** and **Skipper Narrows** to **Florida Passage** but should not be attempted without local knowledge as the crooked narrow section at the upper end of Skipper Narrows almost bares at low water.

Medway River enters the sound from the westward and is navigable through **Belfast River** as far as **Belfast**, the former site of a large sawmill, now dismantled. A draft of 7 feet (2.1 m) can be taken to Belfast according to surveys of 1934. A draft of about 13 feet (4.0 m) can be taken to the entrance to Belfast River, a distance of 6½ miles. **Sunbury**, formerly a settlement of some importance, now has one wharf serving an oyster plant. Water can be secured at the wharf. Roads lead from Sunbury and Belfast to join the main highways. There is a pile of rocks, bare about 3 feet (0.9 m) at low water in surrounding depths of 12 feet (3.7 m) in mid-channel off the bluff at Belfast.

Walburg Creek enters the sound from southward just inside its entrance and with **North Newport River**, **Johnson Creek**, and **South Newport River** forms the section of the **Intracoastal Waterway** to **Sapelo Sound**. The controlling depth through this passage was 9 feet (2.7 m) in 1934 on the range at the junction of Walburg Creek and North Newport River.

There is good anchorage in Walburg Creek and a dock (privately owned) on its east bank.

North Newport River enters the sound from southward just west of Walburg Creek. It is of little commercial importance, except for that small portion of it which forms part of the **Intracoastal Waterway**. According to surveys of 1934 a draft of 12 feet (3.7 m) can be taken to a point about 12 miles above the mouth of the river, and about 6 feet (1.8 m) nearly up to the railroad bridge (closed).

Timmons and **South Newport Rivers** have no importance above the sections near the **Intracoastal Waterway**. Both are used locally by

those with local information. A wharf, privately owned, is located on the South Newport River 5 miles above its junction with Johnson Creek.

COAST FROM ST. CATHERINES SOUND TO SAPELO SOUND

(Charts 1241, 573, and 574)

The coast line from St. Catherines Sound to Sapelo Sound is formed by St. Catherines Island. This lies nearly in a north and south line, having a length of 9½ miles and a breadth at its widest part of about 3 miles. The whole island is flat, and extensive portions of it are marshy. Its higher parts are heavily wooded. Seen from seaward, at a distance it presents no prominent distinguishing features, showing only dense woods in level outline. It has a white sand beach, and near its center there are sand hills 20 feet (6.1 m) high, which show up from some directions.

There is a prominent sand dune 3 miles south of the north end of St. Catherines Island and about 1 mile north of McQueen Inlet. This is the only landmark in the vicinity and is reported to show well from seaward. The island is separated from the marshes lying between it and the mainland by Walburg Creek, Johnson Creek, and the South Newport River.

McQueen Inlet is the only break visible on the seaward side of the island. It is unimportant, as it is blocked by shoals at low water. Dangerous shoals make off from the eastern shore to a distance of 5 miles. Between the south point of this island and the north point of Blackbeard Island lies the entrance to Sapelo Sound.

SAPELO SOUND

(Chart 574)

Sapelo Sound is 10 miles northeastward of Sapelo Lighthouse and 34 miles southwestward of Tybee Lighthouse. The entrance is obstructed by shifting shoals which extend nearly 5 miles seaward, through which there is a channel with a least depth of 19 feet (5.8 m) according to surveys made in 1925. The sound affords excellent anchorage for any vessel that can cross the bar. There are no towns or villages of any importance on the sound or its tributaries.

The break in the shore at the entrance to the sound can be seen a distance of about 8 miles on a clear day, and the old quarantine station can be seen from the sea buoy. Sapelo Lighthouse, 10 miles southwestward of Sapelo Sound, can also be seen from off the bar and is a good mark. The light station has been discontinued.

Sapelo Lighted Whistle Buoy 2 S, lat. 31°28′30″ N., long. 80°54′30″ W., is located about 15 miles eastward of Sapelo Sound entrance in 48 feet of water. The light is flashing white, 1 second, every 6 seconds.

Directions.—Shoals extend about 5 miles from shore, and vessels should keep in a depth of over 5 fathoms (9.1 m) until the sea buoy is sighted.

With the aid of the chart, vessels of 15-foot (4.5 m) or less draft, on a rising tide with a smooth sea, should have no difficulty in entering during daylight by following the buoys. A comparison of the

surveys made in 1859, 1902, and 1925 shows practically no change in the bar during that time, except in the vicinity of the shoalest part of **Experiment Shoal**, which has moved southward more than ¼ mile; the slue between that shoal and St. Catherines Island has also deepened and extended and now shows up as a swash channel with least depth of over 9 feet (2.7 m). Another channel through the shoals south of the main channel had 8 feet (2.4 m) at low water in 1925. It is unmarked but is used by fishing boats.

When in the sound, pass about ¼ mile northward of the old quarantine structure in the water and stand westward in the buoyed channel to an anchorage northward of Dog Hammock Spit.

The **Intracoastal Waterway** enters Sapelo Sound from the northward through South Newport River and continues southward to Doboy Sound through Sapelo River, Front River, Creighton Narrows, and Old Teakettle Creek.

Anchorages.—There is good anchorage anywhere in the channel of the sound, but vessels entering for shelter usually anchor in South Newport River or on either side of Dog Hammock Spit.

Tides.—The mean rise and fall of tides is about 7 feet (2.1 m). In the entrance to the sound the average strength of the flood and ebb currents are about 2 and 2½ knots, respectively.

Pilots for Sapelo Sound can be obtained by writing or wiring to Darien. Pilotage is not compulsory unless the vessel is spoken by a pilot.

Pilotage rates.—Following are the rates of pilotage for Doboy and Sapelo Bars and for Darien and Sapelo River:

Rates of pilotage

Draft	Bar pilotage to upper buoy or safe anchorage	River pilotage from upper buoy or safe anchorage to Darien or any other landing	Total	Draft	Bar pilotage to upper buoy or safe anchorage	River pilotage from upper buoy or safe anchorage to Darien or any other landing	Total
6 feet	$11	$8	$19	16½ feet	$48	$34	$82
7 feet	12	9	21	17 feet	52	37	89
8 feet	13	10	23	17½ feet	54	39	93
9 feet	16	12	28	18 feet	58	41	99
10 feet	18	13	31	18½ feet	60	43	103
11 feet	21	14	35	19 feet	64	46	110
12 feet	23	19	42	19½ feet	67	48	115
12½ feet	26	21	47	20 feet	70	49	119
13 feet	31	23	54	20½ feet	75	50	125
13½ feet	34	25	59	21 feet	82	53	135
14 feet	35	26	61	21½ feet	90	55	145
14½ feet	36	27	63	22 feet	105	57	162
15 feet	41	30	71	22½ feet	120	60	180
15½ feet	43	31	74	23 feet	135	62	197
16 feet	46	33	79				

Drop, $7; every day's detention, $3; foreign vessels, 50 percent additional to the above rates.

South Newport River enters the sound from northward just inside the entrance; the river has a channel depth of 11 feet (3.3 m) for a distance of 11 miles to its junction with North Newport River.

and at high water 8 feet (2.4 m) can be taken about 5 miles farther up the river. Entering the sound from northwestward is **Barbour Island River**, through which a draft of 8 feet (2.4 m) at high water can be taken to South Newport River; in its northern part the channel leads southward and eastward around the large island to South Newport River.

Sapelo River, which enters the sound from westward, is navigable at low water, according to surveys in 1934, for vessels of a draft of 7 feet (2.1 m) for a distance of 4 miles to the small landing at **Fairhope**, and a draft of 3 feet (0.9 m) to a point about 1 mile below the closed county bridge at **Eulonia** post office.

In 1934 a draft of 13 feet (4.0 m) could be carried from the deeper waters of Sapelo River into the mouth of **Front River**. On the western side, just inside the entrance to Front River, were formerly the loading berths for **Darien**. Artesian water is piped to the point.

At the head of Front River a dredged channel through **Creighton Narrows** affords a passage, with a controllng depth of 8.2 feet (2.5 m) in March 1935, to Old Teakettle Creek and thence to Doboy Sound. The **Intracoastal Waterway** follows this route.

Mud River enters the head of Sapelo Sound from southward; it is a broad, shallow body of water, with a channel depth of 5 feet (1.5 m) in 1934, marked by range beacons, and is important only as a part of an alternate route of the **Intracoastal Waterway** between Savannah and Fernandina. No further dredging will be done to maintain this depth, as the main **Intracoastal Waterway** leads through Front River.

For details of the route in this locality, see Inside Route Pilot, New York to Key West.

COAST FROM SAPELO SOUND TO DOBOY SOUND

(Chart 1241)

The coast line from Sapelo Sound to Doboy Sound is formed by the shores of **Blackbeard** and **Sapelo Islands**. These are separated only by a strip of marsh and a narrow inlet leading into **Cabretta Creek**. At low water 2 feet (0.6 m) can be taken into this inlet and through the creek into Sapelo Sound. Local boats use this passage frequently. From all points of view they appear as a single island and may be described as one. Taken together they have a length of 10½ miles in a north-northeasterly direction and with a width of about 4 miles. Large portions of both islands are heavily wooded, but the western part of Sapelo Island consists almost entirely of broad marshes through which wind numerous creeks. The most important of these is **Duplin River**, which has deep water for several miles and affords means of communication to the island. Sapelo Island is separated from the marshes lying between it and the mainland by Mud River and New Teakettle Creek. Seen from seaward, these islands present no well-marked distinguishing features, nothing being visible other than the usual sand beach backed by the dense woods in level outline, with the exception of the lighthouse and old tower near the south point of Sapelo Island.

DOBOY SOUND AND DARIEN

(Charts 574, 575, 1241, and 1242)

Doboy Sound is 46 miles southwestward of Tybee Roads and 16 miles northeastward of St. Simon Lighthouse. It is marked on its northern side by Sapelo Lighthouse (light discontinued) and another unused lighthouse, and on its southern side by an unused lighthouse (two-story building). The entrance is about 1 mile wide and is obstructed by shifting shoals which extend about 4½ miles offshore.

Vessels should keep in a depth of 5 fathoms (9.1 m) or more until the Sea buoy is sighted. If there is too much sea to cross Doboy bar, vessels can make an anchorage in Sapelo Sound.

The surveys of Doboy bar in recent years show it has been changing. It is not considered safe for a stranger to attempt to enter by following the buoys with a greater draft than 8 feet (2.4 m), and then only under the safest condition of a rising tide and a smooth sea.

A swash channel with a least depth of 7 feet (2.1 m) makes into the sound close under the south point of Sapelo Island. It is not marked. Another channel seems to be forming north of the buoyed channel between what is now called North Breakers and Chimney Spit. In 1925 this channel showed a depth of 9 feet (2.7 m). It is not marked.

The sound extends northwestward for a distance of about 5 miles and has an average width of ¾ mile. It is the commercial outlet of numerous tributaries, the town of Darien, and also of the Altamaha River. Lumber is the principal commodity. In recent years very few shipments have been made.

When across the bar, chart no. 574 is a good guide in the sound to an anchorage near the red and black buoy at the entrance of North River. Sailing vessels require a towboat from this anchorage to Darien, but small powered vessels up to about 8½ feet (2.6 m) draft should have no difficulty in going up to the town. Chart 575 is the best guide to Darien.

Tides.—The mean rise and fall of tides is about 7 feet (2.1 m) in the sound and about 7½ feet (2.3 m) at Darien. The tidal currents on the bar have a velocity of about 1½ knots on the ebb and slightly less on the flood. In the entrance to the sound the average velocity at strength is about 2 knots.

Anchorages.—There is good anchorage anywhere in the channel of the sound inside the entrance, but vessels usually stand up until abreast the mouth of North River, near Duplin River Light off its entrance. Vessels subject to visitation by the health officer must wait to be boarded in the sound. There is good anchorage in about 21 feet (6.4 m) in North River, but the channel is too narrow for a large vessel to anchor in Darien River.

Pilots for Doboy bar can be had by writing or wiring to Darien. Pilots for Doboy Sound will also take vessels into St. Catherines or Sapelo Sounds. Bar pilotage is compulsory for certain vessels. (For pilot rates, see Sapelo Sound.)

Towboats can be had at Brunswick. All sailing vessels bound to Darien take a towboat, and, when loaded, tow out over the bar.

Sapelo Lighthouse, lat. 31°23′28″ N., long 81°17′09″ W., is an unused light tower, with red and white bands. Fresh water may be obtained from an artesian well at the lighthouse by using small boats.

Duplin River enters Doboy Sound from northward about 1½ miles inside of Sapelo Lighthouse; it is a small stream about 5 miles long and was good for a depth of 10 feet (3.0 m) in 1934 until near its head.

Sapelo is a post office near the southern end of Sapelo Island. It is reached by boat by going up Duplin River 2 miles to a small creek on the eastern shore; thence up this creek to the first starboard hand creek; thence to the landing. Some supplies and gasoline can be obtained here in an emergency.

New Teakettle Creek enters the sound from northward about 1 mile northwestward of Duplin River. This creek connects with Mud River and forms part of the alternate **Intracoastal Waterway** passage; a depth of 9 feet (2.7 m) could be taken through the creek in 1934. The controlling depth in Mud River was 5 feet (1.5 m).

Old Teakettle Creek branches from New Teakettle Creek and joins Mud River farther westward. The main route of the **Intracoastal Waterway** follows Old Teakettle Creek. The controlling depth in the creek was 9½ feet (2.9 m) in 1934.

Atwood Creek and Hudson River are small streams emptying into the head of the sound from northwestward. About 10 feet (3.0 m) can be taken up the former for a distance of 2 miles, and 9 feet (2.7 m) up the latter to the mouth of the small creek leading to Meridian Landing.

Meridian Landing is on the west side of a small creek entering Hudson River from the north side, about 1¼ miles from the mouth of the river. It is a public landing much used in the shipment of local freight and mail. A shell road leads from the landing to the village of **Meridian** a short distance away. From thence a State highway affords direct connection to **Darien**, about 7 miles, and to **Brunswick, Ga.**, about 25 miles. Boats of over 2-foot (0.6 m) draft anchor in Hudson River, or in the small stream close to the landing at low water, and come alongside whenever a rising tide permits. Fresh water is piped to the dock and gasoline can be obtained from Meridian. Boats of over 60 feet in length should not enter the creek as there is insufficient turning room.

If bound to Meridian Landing stand up Doboy Sound, favoring the east shore after passing the entrance to Folly River, until Hudson River opens up. Then stand across the sound, rounding the point at the south side of the entrance to Hudson River at a distance of about 75 yards, and follow the south shore at the same distance until in the middle of the bend about ½ mile beyond. Then favor the east shore to the mouth of the creek leading to the landing.

Connegan River enters the head of the sound from southwestward. It joins North River by a branch known as **Buzzard Roost Creek**, through which 7 feet (2.1 m) may be taken. (Surveys of 1934.)

North River enters Doboy Sound west of Doboy Island. It extends westward 6 miles to the post village of **Ridgeville**, to which a draft of 9 feet (2.7 m) can be taken. Here it joins **Mayhall Creek**, which, running southward, connects with Darien River 5 miles above its mouth. There is a depth of about 13 feet (4.0 m) in Mayhall Creek,

except where it enters Darien River the depth is only 4 feet (1.2 m); a draft of 8 feet (2.4 m) or more can be taken through at high water.

Blue and Hall Landing is on the west bank of North River about 2 miles by water above the entrance to Buzzard Roost Creek. It is a private landing with good highway connection to Darien, 3 miles distant. At low water 9 feet (2.7 m) can be taken into the river and to this landing. By the aid of a small searchlight or spotlight boats are able to come up the river to this landing after dark. Gasoline can be obtained at the landing.

Back River is on the southern side of Doboy and Commodore Islands and forms another entrance from the sound to North and Darien Rivers. It is little used.

South River enters Doboy Sound from southwestward about ¾ mile inside the entrance. It extends in a general westerly direction for 3 miles, where it joins Little Mud River; it is little used.

Darien River extends southwestward for a distance of 11½ miles, where it joins the **Altamaha River**. The controlling depth to **Darien**, on the north bank of the river, was 7.1 feet (2.2 m) in 1935. Care is necessary for its navigation due to the shoals and numerous floating snags. The water is fresh in the river at Darien after the ebb has been running about three hours. At ordinary low tides a draft of about 3 feet (0.9 m) can be taken into the Altamaha River.

Directions, Darien River.—From Doboy Sound, leave Duplin River Light (flashing white), which marks the east end of a shoal at the north side of the mouth of the **North River**, close to the northward, and steer 225° true (SW. mag.) until about 300 yards from this light; then haul to the westward, heading for the northernmost clump of small trees; then favor the north shore entering the North River, passing about 50 yards off the private landing.

Thence favor the west shore and pass about 100 yards off beacon no. 2. Thence haul southward, slightly favoring the west shore of **Doboy Island** and head for beacon no. 2 A. **Doboy Island** is wooded, and there are several buildings on its southwest end. Water is obtainable and there is a small private landing.

Pass about 50 yards east of beacon no. 2 A and cross **Back River** heading for beacon no. 1, and when about 400 yards from it follow the east shore at a distance of about 100 yards to the mouth of **Darien River**.

Come into the mouth of the Darien River and follow the ebb-tide bends carefully for about 2¼ miles. West of the opening into **Rockdedundy River** there are a number of shoals in the Darien River which must be carefully avoided.

From the opening into the Rockdedundy River favor well the south side of the Darien River until nearly abeam the next point on the north side, then cross and favor well the north side.

Follow the north shore for 50 yards, or until the first prominent point on the south side west of Rockdedundy River bears about south, mag.; cross to the east shore at this point, give the point of land a berth of about 75 yards, and follow that shore for a distance of about 400 yards. Then stand up mid-channel, and continue to follow the ebb-tide bends to **Darien**, passing through **Pico Cut**.

Darien, population 937 in 1930, is 8½ miles above Doboy Island on the north bank of the Darien River. It has telephone and autobus communication, and a first-class highway passes through Darien from Savannah to Brunswick, 18 miles away. Gasoline, ice, fresh water, and supplies are available.

The town now has little commercial importance, as the lumber mills are in ruins. A small amount of lumber is occasionally shipped. A considerable number of shrimp and shad fishermen base at Darien.

There is one small marine railway capable of hauling out boats up to 45 feet (13.7 m) in length. The depth of water alongside the wharves is 7 to 14 feet (2.1 to 4.2 m). There are no berths for large vessels. Vessels make fast to the wharves as the river is too narrow for them to anchor near the town.

A swing highway bridge (hand moved), vertical clearance 23 feet (7.0 m) at high water, horizontal clearance 100 feet (30.5 m), crosses the Darien River at the town.

Light-draft vessels running between Darien and Brunswick formerly used the route through **Threemile Cut** to the **Altamaha River**. It is reported that shoaling of the Altamaha River crossing has occurred and has made this route almost impracticable.

The **Intracoastal Waterway** enters Doboy Sound through **Old Teakettle Creek** and passes southward through **North River, Darien River. Rockdedundy River** and **Little Mud River** to **Altamaha Sound**..

ALTAMAHA SOUND

(Chart 575)

Altamaha Sound is 5 miles southward of Sapelo Lighthouse and about 11 miles northeastward of St. Simon Lighthouse. The entrance is so much obstructed by shoals and the sound itself is so full of them that it is rarely entered by anyone, and never by strangers. There is a channel through the shoals, which extends out for a distance of 4 miles from the entrance, but this channel shifts and is not marked.

Sailing directions of any value cannot be given. It is advisable in every case where a vessel desires to enter Altamaha Sound, if coming from the northward, to pass into Doboy Sound; or, from the southward, to pass into St. Simon Sound, and then through the **Intracoastal Waterway** to Altamaha Sound. In either case a local pilot should be obtained.

Tides.—The mean rise and fall of tides in the entrance to Altamaha River is about 6½ feet (1.9 m).

Altamaha River is formed by the confluence of the Oconee and Ocmulgee Rivers, 112 miles above the town of Darien and 122 miles above its mouth, and flows in a general southeasterly direction, entering the western end of Altamaha Sound. The river has no importance above the highway bridge at Darien, although it can be traversed by careful navigation for a distance of about 10 miles above. The river is subject to flood conditions and the depths change radically. There is a least depth of about 1½ feet (0.4 m) throughout its length at ordinary summer low water. The influence of the tides is felt in the river for a distance of about 20 miles above Darien.

Three trunk-line railroads cross the Altamaha River, but the only place where there is a landing with rail connection is at **Doctortown**, where there is a small lumber mill. Commercial traffic in the Altamaha and its tributaries has now practically ceased.

Oconee River has a channel depth of about 1 foot (0.3 m) at ordinary summer low water to the city of **Milledgeville**, about 126 miles above its junction with Altamaha River. Three trunk-line railroads cross the Oconee River below the head of navigation. **Dublin** is a landing where there is a rail connection.

Ocmulgee River has a channel depth of about 1.5 feet (0.4 m) at ordinary summer low water for a distance of 178 miles to the city of **Macon**. The principal cities, towns, and villages on the river, with their distances above the junction with the Altamaha River, are **Lumber City**, 10 miles; **Abbeville**, 62 miles; **Hawkinsville**, 114 miles; and **Macon**, 178 miles. Transfer of freight between the river and connecting railroads is practicable at Macon and Lumber City by means of elevating machinery; at Hawkinsville, Abbeville, Barrows Bluff, and Mosquito Bluff by means of spur tracks and highways.

Little Mud River enters Altamaha Sound from northward about 2½ miles inside the entrance. The controlling depth on the range leading into Altamaha Sound was 9 feet (2.7 m) in 1934. The **Intracoastal Waterway** passes through Little Mud River.

Buttermilk Sound enters Altamaha Sound from southwestward. It has an average width of ½ mile but is full of shoals, through which there is a narrow channel. At its head the sound connects with Frederica River and Mackay River, the latter connecting with Back River. These three rivers enter the western end of St. Simon Sound from northward, and Frederica River with Buttermilk Sound forms part of the **Intracoastal Waterway** through which a draft of 5.8 feet (1.8 m) can be taken at low water. This is the controlling depth (1934) on the entrance range from Altamaha Sound.

COAST FROM ALTAMAHA SOUND TO ST. SIMON SOUND

(Chart 1242)

This coast line, having a length of 11⅜ miles and trending about south-southwestward, is formed by the shore of **Little St. Simon Island**, **Isle of Palms** (locally known as "Long Island"), and **St. Simon Island**. These are separated only by stretches of marsh traversed by small streams and appear as one body of land when seen from seaward, although from certain points of view the marshes, alternating with patches of trees, give the land an unusually broken appearance.

Of the three named, St. Simon Island forms the main body of land between the two sounds, and in a general description the other two may be considered as parts of it. The three thus taken together form a body of land 11⅜ miles in length and 6 miles in width at its northern end, diminishing gradually to 2½ miles near its southern point. Immediately along the coast and in the central parts it is heavily wooded. Between the two wooded portions there is a stretch of marsh from a mile to 1½ miles in width extending nearly the whole length of the island, and to the westward it is separated from the mainland by extensive marshes, through which flow the Frederica and Mackay Rivers, connecting Altamaha and St. Simon Sounds.

The northern portion is mainly marshy and is traversed by **Hampton River**, a stream of some size, which, flowing in an easterly and southeasterly direction, separates St. Simon and Little St. Simon Islands and comes out on the coast 5 miles below Altamaha Sound. There were 6 feet (1.8 m) of water on the bar at the entrance in 1924, but there are dangerous shoals on both sides and the channel is unmarked. Inside the bar 8 feet (2.4 m) can be carried through to Buttermilk Sound at low water.

Village Creek empties into Hampton River from the southward, about 1½ miles above its mouth. It flows through a stretch of marsh separating Isle of Palms from St. Simon Island. At low water the channel of Village Creek is practically dry. After a crooked course of several miles it connects with **Blackbank River**, a narrow and tortuous stream flowing to the southward between the two islands named and entering the sea about 4 miles south of Hampton River.

There is a highway bridge with fixed span (15 feet (4.5 m) vertical clearance) across the Blackbank River.

The southern part of St. Simon Island is heavily wooded. The buildings of a summer resort and the white tower of St. Simon Lighthouse are conspicuous objects from seaward. All along the coast dangerous shoals make off from 3 to 5 miles.

ST. SIMON SOUND AND BRUNSWICK HARBOR

(Chart 447)

St. Simon Sound lies 17 miles southward of Sapelo Lighthouse and 27 miles northward of Amelia Island Lighthouse. On the northern side of its entrance, which is ⅞ mile wide, is St. Simon Lighthouse. This sound is one of the most important harbors on the coast of Georgia, being the approach to the city of Brunswick, which is the second seaport in commercial importance in the State.

The entrance is obstructed by dangerous shifting shoals, which make offshore to a distance of 5½ miles, forming a bar through which there is a dredged channel, 300 feet wide with a controlling depth of 27½ feet (8.4 m) in June 1934, marked by range lights and buoys. Draft of 28 feet (8.5 m) are taken over the bar at high water. Inside the bar and in the channel of the sound there is a good depth of water and excellent anchorage.

There is a depth of 23 feet (7.0 m) ⅜ mile northward of the northern point of Jekyll Island. The shoals to the westward have extended eastward to this position.

A shoal of 26 feet (7.9 m) was reported to exist about 1 mile southward of *St. Simon Lighted Whistle Buoy St. S.*

Prominent features.—In clear weather St. Simon Lighthouse shows well at a distance of 8 miles, and from the lighted whistle buoy Little Cumberland Island unused lighthouse can be seen southwestward. Near the beach eastward and northeastward of St. Simon Lighthouse are a number of cottages and several large houses.

Tides.—The mean rise and fall of the tides on the bar is about 6½ feet (1.9 m), and at Brunswick about 7½ feet (2.3 m).

The **tidal currents** follow the general direction of the dredged channel across the bar and have an estimated velocity of 1 to 2 knots. They set diagonally across the Plantation creek range

with an average velocity at strength of about 2 knots. Currents turn about one-half hour after high and lower water.

Brunswick Lighted Whistle Buoy 2 B, lat. 31°00′ N., long. 81°10′ W., is moored in 49 feet (14.9 m) off the entrance to St. Simon Sound and Brunswick Harbor, approximately on the St. Simon Range line. The light is flashing white, every 3 seconds, 16 feet above the water, visible 9 miles.

St. Simon Lighthouse, lat. 31°08′02″ N., long. 81°23′38″ W., is a white conical tower attached to a brick dwelling. The light is fixed white varied by a white flash of 5 seconds duration every 60 seconds, 104 feet (31 m) above the water, and visible 16 miles. It is the rear beacon of St. Simon range.

St. Simon is a summer resort and landing at the south end of the island of St. Simon.

Frederica River enters St. Simon Sound from the northward about 1 mile inside the entrance. The **Intracoastal Waterway** passes through Frederica River and Buttermilk Sound to Altamaha Sound.

Back River, with **Mackay River**, is an alternate route of the **Intracoastal Waterway** to Buttermilk Sound and Altamaha Sound. There is a controlling depth of 9 feet (2.7 m) at low water through Back River to Mackay River. **Mackay River** is closed by a fixed-span highway bridge with a vertical clearance of 6 feet (1.8 m).

Plantation Creek and Clubbs Creek have been improved to a depth of 7 feet (2.1 m). There was a controlling depth of 5½ feet (1.7 m) in June 1935. The entrance from Brunswick River is ½ mile above the quarantine station, and the channel then leads through a cut across the marsh in a northeast direction, cutting off the westerly loop of Plantation Creek. The channel is in the middle of Plantation Creek, except in the reach trending southward of east, where it favors well the north bank; then, after favoring the outside of the sharp head, the channel favors the east bank until halfway up the northward trending reach. The channel then leads through a cut to Clubbs Creek and so in mid-creek to Back River.

Brunswick River enters the sound from southward and just inside the entrance. The river for a distance of 2¾ miles above its mouth has an average width of 1¼ miles, but the deep-water channel averages only a little over ¼ mile in width, and in one place is only 200 yards wide. Above Brunswick Point, the river for a distance of about 2½ miles has an average width of ¾ mile, and above this it is divided into two branches by Buzzard Island. The southern branch is known as **Turtle River**, and the northern branch, on which the city of Brunswick is situated, is known as the **East River**, or Brunswick Harbor.

South Brunswick River enters Turtle River from westward opposite Buzzard Island. **Fancy Bluff Creek** enters South Brunswick River from the southwestward 1¼ miles above its mouth. This creek affords a narrow channel, good for a depth of about 3.8 feet (1.6 m) at low water, to Little Satilla River. A highway bridge, horizontal clearance 39.7 feet (12.1 m), vertical clearance 21.6 feet (6.6 m) at mean low water, crosses the South Brunswick River about 1½ miles above the entrance to Fancy Bluff Creek.

Jekyll Creek enters Brunswick River from southward about 2½ miles above its mouth; with Jekyll and St. Andrews Sounds it forms

part of the Intracoastal Waterway to Fernandina. A depth of 9 feet (2.7 m) (surveys of 1934) at low water can be taken from Brunswick River through the creek. The dredged entrance from Brunswick River is marked by Jekyll Creek Jetty range and a jetty. There is a settlement on the east side of the creek.

Directions for entering Jekyll Creek.—The end of the jetty on the west side of the entrance into the creek is marked at its end by Jekyll Creek Jetty Light 2. Jekyll Island Front Range light stands about 25 yards to the westward of the beacon. The jetty covers at half tide.

To enter, stand through the dredged channel on the Jekyll Creek Jetty Range ahead, passing eastward of beacons no. 4 and no. 6. Follow the jetty at a distance of about 30 yards, veer eastward 65 yards northeastward of Jekyll Creek Jetty Front light, and stand through the narrow part of the creek in mid-stream until Jekyll Creek Range Beacons No. 3 are in line astern.

Hold this range until abeam of Jekyll Creek Beacon No. 1, then close Jekyll Creek Range Beacons No. 2 ahead. There is a shell breakwater, awash at high water, extending southeastward from the end of the marsh on the west side of the channel.

Continue on range no. 2 until abeam of Jekyll Creek Range No. 1 front beacon, then haul southward and close Jekyl Creek Range Beacons No. 1 astern.

Hold range no. 1 to the middle of Jekyll Creek, leaving Jekyll Creek Light No. 8, which marks a shoal, 110 yards to westward.

The dredged channels, marked by these range beacons, had a controlling depth of 6.9 feet (2.1 m) in February 1935, and lead between flats that are partly bare at low water.

Then keep near mid-stream for ½ mile until abreast the wharves and settlement on the east side, and then follow the east bank at a distance of about 150 yards to **Jekyll Sound.**

DIRECTIONS, ST. SIMON SOUND

There is a project depth of 27 feet (8.2 m) for a width of 500 feet across the bar; 24 feet (7.3 m) and 400 feet width to Brunswick Point; 24 feet (7.3 m) and 350 feet width in Brunswick Harbor and Turtle River; and 24 feet (7.3 m) and 150 feet width in Academy Creek.

In June 1935 the controlling depths were as follows:

Bar	28.7 feet (8.7 m)
Brunswick Point	28.0 feet (8.5 m)
Lower Turtle River	26.1 feet (8.0 m)
Upper Turtle River	26.4 feet (8.0 m)
East River	23.0 feet (7.0 m)
Academy Creek	11.2 feet (3.4 m)
Back River	11.4 feet (3.5 m)

All of the dredged channels are marked by range lights and buoys. The tidal currents set with the channel on the bar, but with northerly or southerly winds a current, which should be kept in mind, sets with the wind across the channel.

Approaching St. Simon Sound from any direction, shape the course for the vicinity of *Brunswick Lighted Whistle Buoy 2 B*, from which a 303° true (NW. by W. ⅛ W. mag.) course for 7

miles will lead to *St. Simon Lighted Whistle Buoy St. S.* In clear weather, when *Brunswick Lighted Whistle Buoy 2 B* is sighted, a course can be shaped to pass as much as 5 miles inside of it; then bring it astern on a 303° true (NW. by W. ⅛ W. mag.) course until up with *St. Simon Lighted Whistle Buoy St. S.* Soundings of 4½ to 5½ fathoms (8.2 to 10 m) have been found on what appears to be a bank or broken ground, lying 4½ miles east and east-southeastward of *St. Simon Lighted Whistle Buoy St. S.* This area should be avoided in heavy weather. There is also a spot with 4½ fathoms (8.2 m) over it lying about ⅜ mile north-northeastward of *St. Simon Lighted Whistle Buoy St. S.*

See "Caution" on page 153.

Courses and distances, St. Simon lighted whistle buoy St. S. to Brunswick

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G. green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. **St. Simon Lighted Whistle Buoy St. S.**, bearing SW. by S., dist. 50 yards. Steer St. Simon Range (front light Fl. W., rear light F. Fl. W.) ahead; pass midway between the buoys marking the dredged cut:	°	*Points*	*Nautical miles*
Direct	303	NW. by W. ⅛ W.	6.1
Reverse	*123*	*SE. by E. ⅛ E.*	*6.1*
2. **St. Simon Lighted Bell Buoy 13** (Quick Fl. G.), bearing S., dist. 150 yards. Steer Plantation Creek Range (front light Fl. R., rear light Occ. R.) ahead; pass 150 yards N. of St. Simon Bell Buoy 15:			
Direct	285	WNW. ¾ W.	1.5
Reverse	*105*	*ESE. ¾ E.*	*1.5*
3. **St. Simon Lighthouse**, bearing NE. by E. ¼ E., dist. ½ mile. With St. Simon Lighthouse astern, pass 175 yds. northwest of Jekyll Spit Buoy 17:			
Direct	240	SW. by W. ¼ W.	.8
Reverse	*60*	*NE. by E. ¼ E.*	*.8*
4. **Jekyll Point Buoy 16**, bearing N. by W., dist. 150 yards. Steer Jekyll Island Range (front light Fl. W., rear light Occ. W.) ahead:			
Direct	217	SW. ¾ S.	1.0
Reverse	*37*	*NE. ¾ N.*	*1.0*
5. **Brunswick Point Flats Buoy 18**, bearing NW., dist. 225 yards. Steer Cedar Hammock Range (front light Fl. G., rear light Occ. G.) ahead:			
Direct	255	WSW. ⅝ W.	1.2
Reverse	*75*	*ENE. ⅝ E.*	*1.2*
6. **Brunswick Point Lighted Buoy 20**, bearing N., dist. 125 yards. Steer Brunswick Point Cut Range (front light Fl. G., rear light Occ. G.) astern:			
Direct	294	NW. by W. ⅞ W.	2.0
Reverse	*114*	*SE. by E. ⅞ E.*	*2.0*

Courses and distances, St. Simon lighted whistle buoy St. S. to Brunswick—Con.

Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G. green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
7. **A. B. & A. R. R. Tank,** bearing N., dist. 1,100 yards. Steer Brunswick Harbor Range (front light Fl. G., rear light Occ. G.) ahead; pass 150 yds. west of Pier E Lt. (Fl. R.). If bound up Turtle River see 7a below:	°	*Points*	*Nautical miles*
Direct	344	N. by W. ½ W	2. 0
Reverse	*164*	*S. by E. ½ E*	*2. 0*
8. **Brunswick Harbor docks.** Follow closely along wharves on east side:			
Direct	0	N. ⅛ W	. 3
Reverse	*180*	*S. ⅛ E*	*. 3*
9. **Academy Creek docks.**			
TURTLE RIVER			
7a. **A. B. & A. R.R. Tank,** bearing N., dist. 1,100 yards. Steer Turtle River Lower Range (front light Fl. W., rear light Occ. W.) ahead; pass 75 yds. north of buoys 1 and 3:			
Direct	294	NW. by W. ⅞ W	1. 7
Reverse	*114*	*SE. by E. ⅞ E*	*1. 7*
8a. **Turtle River Buoy 2,** bearing N. by E., dist. 400 yards. Steer Blythe Island Range (front light Fl. W., rear light Occ. W.) ahead; pass 200 yds. east of Turtle River Upper Front Lt. (Fl. W.):			
Direct	338	NNW	1. 3
Reverse	*158*	*SSE*	*1. 3*
9a. **Turtle River Buoy 4,** bearing E., dist. 100 yards. Steer Turtle River Upper Range (front light Fl. W., rear light Occ. W.) astern; pass 75 yds. west of buoy 6 and 125 yds. east of Turtle River Lt. 5 (Fl. G.):			
Direct	10	N. ⅞ E	1. 8
Reverse	*190*	*S. ⅞ W*	*1. 8*
10a. **Southern Rwy. docks:**			
Direct	338	NNW	. 5
Reverse	*158*	*SSE*	*. 5*
11a. **Atlantic Refining Co. wharf.**			

BRUNSWICK

Brunswick, which had a population of 14,022 in 1930, is on the eastern bank of East River opposite Buzzards Island, 7½ miles above St. Simon Lighthouse and 4½ miles off the track of the **Intracoastal Waterway** southward. It is a shipping port for crude oil, piling, creosoted ties, and naval stores. Its principal industries are crude-oil refining, wood creosoting, sea-food packing, and the manufacture of rosin and turpentine, wood containers, fertilizers, and lumber products. A considerable amount of sugar is imported. Good hotel accommodations are available in the city.

Quarantine.—The national quarantine station is at Brunswick Point, on the north bank of Brunswick River, about 1½ miles below the city. Vessels subject to visitation by the health officer will be boarded in the sound.

Pilots.—Pilots are on the lookout at St. Simon Lighthouse and will come out when a vessel is sighted. Pilotage is compulsory for certain vessels. Vessels are usually boarded from 7 to 10 miles offshore.

Pilotage.—The following rates of pilotage for the Bar of St. Simons and Turtle River and Satilla River were adopted by the Pilot Commissioners on June 1, 1923:

Rates of pilotage

Draft	Pilotage	Draft	Pilotage	Draft	Pilotage
6 feet	$15	14½ feet	$60	22½ feet	$130
6½ feet	16	15 feet	64	23 feet	135
7 feet	17	15½ feet	68	23½ feet	140
7½ feet	18	16 feet	72	24 feet	145
8 feet	20	16½ feet	76	24½ feet	150
8½ feet	22	17 feet	80	25 feet	155
9 feet	24	17½ feet	84	25½ feet	160
9½ feet	26	18 feet	88	26 feet	165
10 feet	28	18½ feet	92	26½ feet	170
10½ feet	30	19 feet	96	27 feet	175
11 feet	32	19½ feet	100	27½ feet	180
11½ feet	36	20 feet	105	28 feet	185
12 feet	40	20½ feet	110	28½ feet	190
12½ feet	44	21 feet	115	29 feet	195
13 feet	48	21½ feet	120	29½ feet	200
13½ feet	52	22 feet	125	30 feet	205
14 feet	56				

Vessels calling for bunkers or repairs only, pay one-half the above rates.
Detention of pilots, per day, $5.
Drop or shifting, $1 per foot on vessel's draft.

Harbor regulations.—The limit of speed of steamers passing the wharves of Brunswick is 4 miles an hour, and the engine must be stopped and turned over slowly when passing where two or more vessels are moored abreast and where barges or flats are employed at any point in the harbor.

Anchorages.—There is good anchorage anywhere in the channel in St. Simon Sound or Brunswick River off the range lines. Off the city of Brunswick there is no anchorage, except for small craft westward of the Brunswick Harbor range. Small vessels can anchor in East River near the mouth of Academy Creek.

Terminal facilities.—The facilities for loading and discharging cargoes at Brunswick are good. There are from 7 to 28 feet (2.1 to 8.5 m) alongside the wharves, according to locality, and 26 feet (7.9 m) at the wharves of the Southern Railway on Turtle River. The railroad parallels the water front and serves the separate wharves by spurs. All wharves except the Southern Railway terminals have highway or street connections. None of the wharves are equipped with mechanical unloading devices, except those owned by the Southern Railway Co. and the Atlantic Refining

Co., the latter wharf being equipped with a pumping station for the discharge of fuel oil from ships.

The warehouses at Brunswick are located near the water front and have rail connections.

Fresh water can be obtained at the wharves.

Supplies.—Provisions, ship chandler's stores, anthracite or bituminous coal, gasoline, fuel oil, ice, and fresh water can be obtained at Brunswick.

Repairs.—There are good facilities available for the repair of machinery of any kind. There is a marine railway with a capacity of 900 tons, draft forward 7 feet (2.1 m), aft 12 feet (3.6 m), at low water, and length of 125 feet. This railway can handle light-draft barges 200 feet in length. Savannah and Jacksonville are the nearest places where larger vesssls can be hauled out for extensive repairs. One wharf is equipped with a derrick capable of handling a 50-ton lift.

Towboats are usually employed by the larger and deeper-draft sailing vessels. They can be had at Brunswick and by making signal outside. There is only one towboat stationed at Brunswick.

Communications.—The Port of Brunswick is served by the Southern Railway System, the Atlantic Coast Line Railroad, and the Atlanta, Birmingham and Atlantic Railway. There is steamship connection with Atlantic and Gulf coast cities, and thrice-weekly boat service to Jacksonville. There is also daily boat service to Jekyll Island.

Aviation fields.—Redfern Field, the municipal airport, is located on St. Simons Island, 5½ miles east of Brunswick. The field is lighted and has two runways, 2,800 feet and 1,800 feet long, respectively. There are facilities in the daytime for servicing aircraft.

Sawtell Field is a commercial airport 5 miles northwest of Brunswick. There are two runways, 2,500 feet and 2,000 feet long, respectively. There are facilities in the daytime for servicing aircraft.

Storm warnings are displayed at Brunswick.

United States Public Health Service.—There is a relief station of the United States Public Health Service at Brunswick.

COAST FROM ST. SIMON SOUND TO ST. ANDREW SOUND

(Chart 1242)

This stretch of coast, trending very nearly north and south, is formed by the shores of **Jekyll Island,** which has a length of 6½ miles and a width of 2 miles. The island is wooded all along its eastern shore. To the westward large portions of it are marshy. Seen from seaward, it shows the usual stretch of sand beach with many conspicuous bluffs and sand hills, backed by dark woods, which are quite level in general outline but with many tall pines showing above the main body. There is a settlement on the western side, reached through **Jekyll Creek.**

From the east shore of this island shoals make off to a distance of 3 to 5 miles. To the westward the island borders on the Brunswick River, Jekyll Creek, and Jekyll Sound. By the creek it is separated from an extensive track of marsh lying between it and the mainland. This marsh is cut up by numerous small streams connecting Brunswick River with Jekyll and St. Andrew Sounds.

ST. ANDREW SOUND

(Chart 448)

St. Andrew Sound lies about 7 miles southward of St. Simon Sound and 17 miles northward of St. Marys entrance. On the southern point at its entrance is an unused lighthouse tower. In the sound are extensive shoals, between which channels lead into its principal tributaries, which are known as Jekyll Sound, Satilla River, and Cumberland River. The entrance is over a shifting bar, which extends 5 miles offshore and is usually good for a depth of 14 feet (4.3 m) at low water. The entrance, as marked by the buoys, had a controlling depth of 10 feet (3.0 m) in 1934. The sound is little used as a harbor.

Pilots may be obtained for St. Simon bar at Brunswick, and there is one on Cumberland Island at High Bluff (locally Cumberland High Point). The pilot regulations and rates for St. Andrew Sound and Satilla River are the same as for St. Simon Sound and Turtle River. Pilotage is compulsory for certain vessels. For rates, see Brunswick.

Towboats.—There are no regular towboats in St. Andrew Sound, but vessels desiring to tow up the Satilla River can get a towboat from Brunswick.

Anchorages.—The best anchorage is in the channel, on the western side of Little Cumberland Island. Here the depth ranges from 3½ to 4½ fathoms (6.4 to 8.2 m), and the holding ground is good. There is also good anchorage in the entrance to Jekyll Sound, westward of the southern end of Jekyll Island.

Tides.—The mean rise and fall of the tides is about 6½ feet (2.0 m). The currents in the entrance are strong, averaging about 2 knots at strength of flood and ebb.

Directions.—Shoals extend about 5 miles from shore in the vicinity of St. Andrew Sound, and the depth should not be shoaled to less than 5 fathoms (9.1 m) (low water) until the sea buoy is sighted. The entrance is marked by an unused lighthouse tower on the north end of Little Cumberland Island and St. Andrew Sound Light (white skeleton structure on Horse Shoe Shoal). *Brunswick Lighted Whistle Buoy* 2B is the principal aid in the northern approach. With the aid of the chart, vessels of about 10-foot (3.0 m) draft should have no difficulty in entering St. Andrew Sound, on a rising tide with a smooth sea, by following the buoys. From St. Andrew Sound the channel to Satilla River leads northward and northwestward of Horse Shoe Shoal, and then across to the south bank of the river, and is marked by beacons and buoys for this distance. See the description of Satilla River.

The **Intracoastal Waterway** which crosses the sound enters from the northward through **Jekyll Creek** and **Jekyll Sound** and passes southward through **Cumberland River to Cumberland Sound, and St. Marys Entrance.**

Jekyll Sound enters St. Andrew Sound from northward just inside the northern point at the entrance. It is full of shoals, between which there are three channels which lead to its three principal tributaries. Jekyll Creek enters the sound from northward. It is part of the **Intracoastal Waterway,** its northern part connecting

with Brunswick River. A depth of 9.6 feet (2.9 m) can be taken from Jekyll Sound to Brunswick River.

Jointer Creek enters Jekyll Sound from northwestward. It is crooked and has a number of narrow branches which connect with Brunswick River above Jekyll Creek. A draft of about 14 feet (4.3 m) can be taken into the creek with local knowledge at low water and about 4 miles above its mouth.

Little Satilla River enters Jekyll Sound from westward and has a controlling depth of 13 feet (4.0 m) at its entrance and for several miles above its mouth. Above its mouth, it is of little importance. Small craft going to the landings on Little Satilla River enter from South Brunswick River through Fancy Bluff Creek, which is good for about 3 feet (0.9 m) at low water.

Cumberland River enters St. Andrew Sound from southward just inside the point of Little Cumberland Island; its general direction is southerly for a distance of 11 miles, where it joins Cumberland Sound. The **Intracoastal Waterway** follows this route and is well marked by ranges in the more difficult sections. The controlling depth was 9.6 feet (2.9 m) in 1935 in "**Cumberland Dividings.**" There are depths of 11 to 12 feet (3.4 to 3.7 m) at the dock at **High Bluff**, and 11 to 13 feet (3.4 to 4.0 m) at the dock at **Cabin Bluff.**

Satilla River enters St. Andrew Sound from westward; its entrance is obstructed by extensive shoals, between which there is a narrow channel. The settlements on the river have communication with Brunswick by telephone, and there is railroad communication from **Woodbine**, 20 miles above its mouth. A railway bridge crosses the river at Woodbine (width of draw, 52 feet). There is also a highway bridge with a wider draw span at this place.

It is reported that, at low water, a draft of 9 feet (2.7 m) can be taken to **Owens Ferry**, 26 miles above the mouth; 3½ feet (1.1 m) to **Burnt Fort**, 42 miles above the mouth; 1 foot (0.3 m) to **Waycross**, 142 miles above the mouth. The mean rise and fall of tides is about 6½ feet (2.0 m) at the entrance and at Ceylon, and about 3 feet (0.9 m) at Burnt Fort.

A considerable amount of lumber was formerly shipped from points on the Satilla River but there is now very little traffic. Provisions and artesian water can be obtained at the settlements; a small quantity of gasoline can be had at Owens Ferry and Woodbine. Most of the landings have highway communication with inland towns. There are a few old docks in the Satilla River, but good anchorage can be found any place in the stream.

Vessels bound to Satilla River formerly entered St. Simon Sound and towed through Jekyll Creek but such vessels as now enter cross St. Andrew Bar. When loaded, they are towed to sea, with the aid of a pilot, over St. Andrew Bar.

Directions, Satilla River.—From St. Andrew Sound, pass about 325 yards south of Raccoon Spit Beacon 2 and steer 254° true (WSW. ½ W. mag.) for 0.6 mile, passing ¼ mile north of buoy no. 5, and then change course to 229° true (SW. ¼ W. mag.).

Continue on course 1.1 miles, passing southeast of buoy no. 8, and change course to 203° true (SSW. mag.) passing 100 yards west of buoy no. 10. The controlling depth at this point is 11 feet (3.4 m).

Continue on course for 1 mile, passing 175 yards off the east bank of the river and follow this bank until 0.6 mile past Floyd Shoal Beacon.

Then change course to 345° true (SW. by W. ¾ W. mag.), cross over the "Bulkhead" and then keep about 220 yards off the starboard bank until north of buoy no. 7 which is the last aid to navigation.

Cross to the southeast bank, passing close westward of buoy no. 7. Keep about 165 yards off the southeast bank until the point on the northwest bank bears 293° true (WNW. mag.).

Then change course to 288° true (WNW. ½ W. mag.) and proceed about 0.6 mile until the point is abeam, 110 yards to starboard.

Favor the right bank, keeping about 165 yards offshore, for 0.9 mile until the west end of **Bailey Cut** has been passed, then change course to 246° true (SW. by W. ¾ W. mag.) and continue for 1.0 mile, clearing the point on the left bank by about 165 yards.

When the point on the right bank bears 312° true (NW. ⅜ W. mag.) change course to 297° true (NW. by W. ¾ W. mag.) and continue on course 0.4 mile until the point is abeam.

Continue northward keeping about 165 yards from the right bank for 1 mile until **Crow Harbor Reach** is open to the west. Steer a mid-channel course for 1 mile until **Crow Harbor Island** (a clump of trees in the marsh) is abeam to starboard. Favor the starboard bank until **White Oak Creek** is passed and then follow mid-channel courses.

The dock at **Ceylon** is dilapidated but tugs moor there occasionally.

Entering **Bailey Cut** from the east, a controlling depth of 9 feet (2.7 m) will be encountered on the shoal to the east of the entrance; the rest of the cut is deeper.

White Oak Creek empties into Satilla River from northward 13 miles above its mouth. A draft of 8 feet (2.4 m) at high water can be taken 10 or 12 miles above its mouth to **White Oak** and **Waverly**, which are railroad stations at the head of navigation on its two branches.

Brickhill River is a branch of Cumberland River, from which it branches about 5 miles above its mouth and again joins it a short distance north of the "Cumberland Dividings." In 1935 the controlling depth at the Cumberland River entrance was 10 feet (3.0 m).

Floyd Creek enters Cumberland River from westward about 4½ miles above the north end of Little Cumberland Island. For a distance of nearly 3 miles above its mouth the channel in the creek has a depth of about 19 feet (5.8 m). With local knowledge, a draft of 3 feet (0.9 m) at high water can be taken from the head of Floyd Creek westward through a dredged cut in the shallow pond known as **Floyd Basin**, into **Todd Creek**, and thence northward to Satilla River.

Shellbine and **Delaroche Creeks** enter Cumberland River from westward. They are both narrow and crooked. The former is navigable for a draft of 7 feet (2.1 m) at low water, and the latter for a draft of 7 feet (2.1 m), but neither creek is of importance. The larger outlet of Delaroche Creek had a controlling depth in 1935 of 9 feet (2.7 m) for a distance of 1½ miles.

COAST FROM ST. ANDREW SOUND TO CUMBERLAND SOUND

(Chart 1242)

This stretch of coast line, extending in a southerly direction for 15¾ miles, is formed by the shores of **Little Cumberland** and **Cumberland Islands.** These two islands are separated only by stretch of marsh and a narrow winding creek and appear as one from seaward. Little Cumberland Island forms the southern boundary of St. Andrew Sound. Its north end is heavily wooded, has a bluff appearance, and is marked by an unused lighthouse tower. Cumberland Island is almost entirely covered by woods, though somewhat marshy to the westward, where it is separated from the main land by extensive marshes, through which flow the waters of Cumberland and Brickhill Rivers, and Cumberland Sound. Its extreme southern point, forming the north side of the entrance to Cumberland Sound, shows a large clump of heavy trees with several conspicuous sand hills. To the northward of this there is a stretch of marsh a mile in width, through which flows **Beach Creek.** There are several buildings and water tanks which are conspicuous.

The entire outer coast line of the island shows a broad white sand beach backed by an almost continuous range of sand hills, and those by dense woods. For about 9 miles from the entrance to St. Andrew Sound this coast is bordered by dangerous shoals making off 3 to 5 miles. For the rest of the distance to the entrance of Cumberland Sound 3 fathoms (5.5 m) may be taken within 1 mile of the beach, excepting at the entrance.

CUMBERLAND SOUND AND ST. MARYS ENTRANCE

(Chart 453)

Cumberland Sound and St. Marys entrance are 16 miles southward of St. Andrew Sound and 19 miles northward of St. Johns River. Amelia Island Lighthouse is about 2 miles southward of the entrance. A standpipe in Fernandina and a water tank on Cumberland Island, 1¾ miles above its south end, are also prominent. The sound extends northward and, connecting with Cumberland River, forms an inland passage to St. Andrew Sound. It is also the approach to the city of Fernandina and the town of St. Marys.

The entrance, which is about 1 mile wide, has been improved by two jetties, which extend from the shore for a distance of 3 miles on the north side and 1½ miles on the south side. The bar, just outside of and between the jetties, has a buoyed channel which, in 1935, had a controlling depth of 24 feet (7.3 m). A depth of 18 feet (5.5 m) was found 110 yards south of the range and south of buoy no. 6.

The channel between the jetties is subject to frequent changes, according to information received from the local pilots. In periods of spring tides, they claim, the currents scour out the channel, but the shoals build up again in neap tides.

Tiger Island Range should not be used more than a mile east of the jetty entrance, except with local knowledge, as no dredging has been done on this part of the channel range for some time. The

least depth across the bar on the range is 19 feet (5.8 m). Ships now pass around the outer bar and approach the jetties from the north, passing north of *Fernandina Lighted Bell Buoy 3 F*, and east of *Fernandina Jetty Lighted Whistle Buoy 2*. The controlling depth on this approach in 1935 was 34 feet (10.4 m).

Lighter draft vessels bound south take the short cut across the bar, avoiding the 13-foot (4.0 m) shoal midway between the ends of the jetties. A shoal, with a least depth of 11 feet (3.4 m), makes out more than a mile southeast from the outer end of the south jetty.

Vessels of greater draft than about 15 feet (4.5 m) are advised to take a pilot.

Tides.—The mean range of the tide at the entrance and at Fernandina is about 6 feet (1.8 m). High and low waters occur about 25 minutes later than at Mayport, daily predictions for which are given in the Tide Tables for the Atlantic Ocean.

The **tidal currents** at the entrance have considerable velocity and are dangerous at times, especially on the flood. Local pilots state that the conditions are about as follows: Between the bell buoy and the end of the north jetty the flood current sets southwestward and with northeasterly winds set strongly in a direction about south-southwest. Under the worst conditions of the flood on spring tides and a northeast gale the velocity near the end of the north jetty is estimated to be as much as 5 knots at times. On the flood an eddy current sets out close along the inside of the north jetty. The ebb current appears to set directly out across the bar. In the present position of the channel, near the north jetty, the worst conditions for entering are on the flood with northeasterly winds, when vessels, especially long ones, are liable to strike the inside of the north jetty. Normally slack water occurs about 1 hour after high and low water at Mayport. With freshets in St. Marys River the ebb current may run from about high water until about one and one-half hours after low water.

The **Intracoastal Waterway** passes through Cumberland Sound and Amelia River.

Amelia Island Lighthouse, lat. 30°40′23″ N., long. 81°26′34″ W., is a white conical tower. The light is flashing white (flash 2.5 seconds, eclipse 7.5 seconds), 107 feet (32 m) above the water, and visible 16 miles.

A red sector from 344 to 360° true covers shoal water in the vicinity of Nassau Sound.

Beach Creek extends northward into Cumberland Island from a point just inside the entrance to Cumberland Sound. There is a controlling depth of 3 feet (0.9 m) to the landing at **Dungeness**.

St. Marys River is a portion of the boundary between Georgia and Florida. The river empties into Cumberland Sound from westward and is its principal tributary. The settlements on the river have telephone communication, and there is railroad communication at St. Marys and Crandall. A gas boat from Fernandina makes frequent trips to points on the river to Kings Ferry. The principal shipping points for lumber are **St. Marys**, 4 miles above the mouth of the river; **Crandall**, 10 miles; and **Kings Ferry**, 32 miles.

The Atlantic Coast Line Railroad bridge (closed) crosses the river 48 miles above the mouth. This bridge is 22 feet (6.7 m) above

high water. The Seaboard Air Line Railway drawbridge (57-foot opening) crosses the river 20 miles above its mouth.

St. Marys River is little used above St. Marys, and below St. Marys only by shrimp fishermen. Local pilots report that vessels loaded to 24 feet (7.3 m) can be taken at high water from St. Marys to sea.

In 1935 the following controlling depths were reported by the local pilots:

Mouth of St. Marys	15 feet (4.6 m)
St. Marys to Kings Ferry	12 feet (3.7 m)
Kings Ferry to ACL Bridge	6 feet (1.8 m)
ACL Bridge to Traders Hill	4 feet (1.2 m)

St. Marys, population 732 in 1930, is a town located on the north bank of the **St. Marys River**, 4 miles above its mouth. It has rail, bus, telegraph, and telephone connections and is a lumber shipping point. A least depth of 15 feet (4.6 m) can be carried to the town at low water.

Gasoline, fuel oil, and water can be obtained at the water front. Ordinary provisions are obtainable, also galley coal in limited quantities. There is a marine railway capable of hauling out boats of about 45 feet length and of about 4½ feet draft. The town recommends itself as a haven for launches in southwesterly weather when it becomes rather disagreeable alongside the wharves at Fernandina.

The wharves at St. Marys have not been maintained in good condition. There are depths of from 5 to 18 feet (1.5 to 5.5 m) at the face of the city wharf on St. Marys River. All the wharves in town (some of which were on the **North River**, which lies on the north side of the town and empties into St. Marys River a short distance below town) have both rail and highway or street connection.

North River.—A draft of 8 feet (2.4 m) can be carried to the docks in North River at low tide. This depth can be carried an additional mile, then a draft of 5 feet (1.5 m) for an additional 5 miles, after which the controlling depth becomes 1 foot (0.3 m).

Directions, St. Marys River.—Coming onto Tiger Island range, between the jetties at St. Marys entrance, follow the range on course 260½° true (W. ⅞ S. mag.) until abeam of Fort Clinch.

Then head for St. Marys River Light 2 on a course of 302° true (NW. by W. ¼ W. mag.) to a position 700 yards from the light.

Steer a course of 265° true (W. ½ S. mag.), passing about 400 yards south of St. Marys River Light 2 and 150 yards off the point on the west side of the entrance to Jolly River.

Then follow the south shore of St. Marys River at a distance of about 150 yards for 1 mile and come onto Long Reach range ahead on a course of 284½° true (WNW. ¾ W. mag.). The controlling depth of 15 feet (4.6 m) to St. Marys is found on this range.

Leaving the range, round the bend to southward and follow the east and south shores at a distance of about 150 yards around the next bend.

With Town Point range closed astern steer 337½° true (NNW. ⅛ W. mag) and come up to the water front of St. Marys.

Above St. Marys follow the ebb-tide bends. Devils Elbow range marks the dredged channel in the river about 2 miles above St. Marys.

Vessels of about 10-foot (3.0 m) draft should have no difficulty in going as far as Kings Ferry on a rising tide. The river is very crooked; some of the turns are sharp.

The mean rise and fall of tides is about 6 feet (1.8 m) at the entrance, 5 feet (1.5 m) at Crandall, 3 feet (0.9 m) at Kings Ferry, and 1½ feet (0.4 m) at the Atlantic Coast Line Railroad bridge. Above the Seaboard Air Line Railway the water in St. Mary's River is fresh and is used by vessels.

Amelia River enters the sound from southward just inside the entrance. The city of Fernandina is situated on the east bank about 2 miles above its mouth.

Bell River enters Amelia River from westward opposite the city of Fernandina. The former river joins St. Marys River about 1½ miles above the town of St. Marys and has a narrow and crooked channel. The controlling depth is 5 feet (1.5 m), found just south of Jolly River, and again at the entrance to St. Marys River. There are a number of small docks at **Chester**, all of which are in a dilapidated condition. In 1935 there was a depth of 2 feet (0.6 m) at mean low water at the face of the largest dock.

Jolly River branches eastward from Bell River about 6 miles above the mouth of the latter and empties into Cumberland Sound at the mouth of St. Marys River. The controlling depth through Jolly River is 5 feet (1.5 m).

Tiger Creek.—A draft of 2 feet (0.6 m) can be carried across the bar into Tiger Creek from Cumberland Sound. From the western end of Little Tiger Island there is a controlling depth of 11 feet (3.4 m) for 1½ miles into Tiger Basin. The basin bares at low water, but small boats can continue across the basin and enter Bell River about 1 mile east of Chester at high tide.

Lanceford Creek.—There is a controlling depth of 11 feet (3.4 m) in Lanceford Creek to the docks about 3 miles west of Fernandina; just above here the creek widens into tidal flats which bare at low tide. Small boats can cross through **Soap Creek** from Lanceford Creek to Amelia River at high tide. Numerous mud flats and oyster beds, bare at low tide, are passed through.

FERNANDINA

(Chart 453)

Fernandina, population 3,023 in 1930, is on the east bank of Amelia River, 2 miles southward of Cumberland Sound. It is a shipping port for fertilizer and naval stores. One railroad enters the city. About 2⅝ miles above Fernandina is Kingsley Creek, through which the South Amelia River is entered; the latter river, extending southward to Nassau Sound, **forms the section of the Intracoastal Waterway** between the two sounds.

Pilots for Fernandina and St. Marys are available and will come out when called for. Their headquarters are at **Old Fernandina.** The usual procedure is to request their services by radio through the consignee. Pilotage is compulsory for certain vessels.

Pilotage.—The pilotage rates for the Cumberland Bar are as follows:

Rates of pilotage

Draft	Pilotage	Draft	Pilotage	Draft	Pilotage
6 feet	$12.00	14½ feet	$65.00	23 feet	$138.00
6½ feet	16.75	15 feet	72.00	23½ feet	141.00
7 feet	20.25	15½ feet	75.00	24 feet	144.00
7½ feet	21.75	16 feet	80.00	24½ feet	147.00
8 feet	23.00	16½ feet	82.50	25 feet	150.00
8½ feet	24.50	17 feet	85.00	25½ feet	153.00
9 feet	26.00	17½ feet	87.50	26 feet	156.00
9½ feet	27.75	18 feet	90.00	26½ feet	159.00
10 feet	30.00	18½ feet	92.50	27 feet	162.00
10½ feet	37.00	19 feet	95.00	27½ feet	165.00
11 feet	40.00	19½ feet	97.50	28 feet	168.00
11½ feet	42.50	20 feet	100.00	28½ feet	171.00
12 feet	45.00	20½ feet	123.00	29 feet	174.00
12½ feet	48.00	21 feet	126.00	29½ feet	177.00
13 feet	50.00	21½ feet	129.00	30 feet	180.00
13½ feet	52.50	22 feet	132.00		
14 feet	56.00	22½ feet	135.00		

Quarantine.—The old quarantine station off Fort Clinch has been abandoned, and ships are now boarded in the harbor abreast the town.

Anchorages.—There is good anchorage in the channel of Cumberland Sound and in the Amelia River up to the city of Fernandina.

Wharves.—Several of the old wharves in Fernandina are in ruins. There is only one wharf capable of handling seagoing vessels. The controlling depths alongside in 1935 were 19 feet (5.8 m) near the north end, 23 feet (7.0 m) at the middle, 12 feet (3.7 m) near the southern end, and the length 1,300 feet. It is equipped with mechanical devices for unloading bulk cargo at the rate of 600 tons per hour. There are numerous smaller wharves operated for the shrimp-fishing fleet, and gas boats in great numbers tie up to these wharves.

Supplies.—Water, gasoline, and oils can be had at the wharves. Provisions and some ship chandlery can be obtained here.

Repairs.—There are no facilities for repairs to vessels or heavy machinery. Jacksonville and Brunswick are the nearest places where vessels can be hauled out and where there are facilities for extensive repairs. Small boats of 50-foot length and 5-foot (1.5 m) draft can be hauled out at Fernandina, and gas-engine repairs can be made there.

Towboats.—Sailing vessels usually employ a towboat when crossing the bar or if bound up St. Marys River; towboats are to be had at Jacksonville or Brunswick.

Storm warnings are displayed in Fernandina from a tower in the post-office yard.

Hospital.—The nearest marine hospital is at Savannah, Ga.

DIRECTIONS, ST. MARYS ENTRANCE

From northward.—From a position about 2 miles southeast of Savannah Lightship make good a course of 204½° true (SSW. ⅛ W. mag.) for 79 miles, passing about 2 miles southeast of *Sapelo*

Lighted Whistle Buoy 2 S. and *Brunswick Lighted Whistle Buoy 2 B.*, to a position where Amelia Island Lighthouse bears 252° true (WSW. ⅜ W. mag.), distant 9.8 miles. On this bearing *Fernandina Lighted Whistle Buoy 1 F* (Fl. W.) is in range with the lighthouse. Then head for the buoy and lighthouse on range and steer 252° true (WSW. ⅜ W. mag.) for 2 miles. This position gives the whistle buoy dead ahead and ½ mile distant and in range with the lighthouse. In clear weather, in daytime, the lighthouse and a nearby standpipe are reported to be visible about 9 miles. In thick weather, if not certain of position, keep in a depth of not less than 7 fathoms (12.8 m).

From southward.—From a position about 0.2 mile southeast of *St. Johns Lighted Whistle Buoy 2 St. J.* a 5° true (N. ½ E. mag.) course made good for 19 miles will pass ½ mile east of *Fernandina Lighted Whistle Buoy 1 F.*, to a position where the buoy and Amelia Island Lighthouse are in range, bearing 252° true (WSW. ⅜ W. mag.), and the buoy ½ mile distant. On this course *Sea Buoy 6 A.* off Nassau Sound entrance will be left about 2.9 miles to westward.

Entrance to Fernandina.—From a position ½ mile from *Fernandina Lighted Whistle Buoy 1 F.*, with the buoy and Amelia Island Lighthouse in range and bearing 252° true (WSW. ⅜ W. mag.), make good a course of 286° true (WNW. ⅝ W. mag.) for 4.4 miles, to a position ½ mile northwest of *Fernandina Lighted Bell Buoy 3 F* (Fl. G.), passing 0.3 mile north of the buoy.

Then make good a course of 211° true (SSW. ¾ W. mag.) for 1⅛ miles, passing close eastward of *Fernandina Jetty Lighted Whistle Buoy 2* (Fl. W.), off the east end of the north jetty, and midway between that buoy and *Bar Buoy 5.*

Come onto Tiger Island range and steer 260½° true (W. ⅞ S. mag.) between the jetties, following this range past the north end of Amelia Island passing about 100 yards south of buoys 4, 6, and 8. Round the northwest end of Amelia Island at a distance of about 300 yards.

Pass about midway between beacon No. 2 and the west shore of Amelia Island, steer 168° true (S. by E. ⅛ E. mag.) for the elevated watertank in Fernandina, and then follow the wharves at a distance of about 100 yards.

COAST FROM CUMBERLAND SOUND TO ST. JOHNS RIVER

(Charts 1243, 453, and 577)

This stretch of the coast is formed by the shores of Amelia Island, Talbot and Little Talbot Islands, and Fort George Island.

Amelia Island lies very nearly north and south, having a length of 11¾ miles and a width varying from 1 to 2½ miles. It is low and flat or gently undulating, is heavily wooded along the coast line, but the western parts are marshy. The island is separated from the mainland by a broad stretch of marsh, through which flow the Amelia and South Amelia Rivers, connecting Cumberland Sound on the north with Nassau Sound on the south.

Seen from seaward, Amelia Island presents no prominent natural features to distinguish it from other land in the vicinity. It shows a long line of dark woods, rather irregular in outline, with numerous trees rising conspicuously above the general level. In front of these

woods is a range of sand hills partly covered with coarse grass and scrub, and in front of these a broad stretch of white sand beach. About 2 miles from its northern end the white tower of Amelia Island Lighthouse, rising from a grove of large trees, forms a conspicuous landmark.

Nassau Sound is 10 miles southward of Amelia Island Lighthouse and 6 miles northward of St. Johns River. The entrance, which is marked by *Sea Buoy 6 A*, is obstructed by shifting shoals which extend about 1¼ miles seaward and form a shallow bar. An unmarked channel between the two low sandy islands about 0.6 mile south of the south end of Amelia Island, is the best place to enter. The channel lies due east and west and had a controlling depth of 6 feet (1.8 m) in 1934.

Tides.—The mean range of tides in Nassau Sound is 5.4 feet (1.6 m).

South Amelia River, which enters the sound from northward, connects with **Kingsley Creek** and through the latter has communication with Amelia River and Cumberland Sound. The **Intracoastal Waterway** follows this route. The depth through this passage was reported to be 7 feet (2.1 m) on October 15, 1935. The mean rise and fall of tides is about 5½ feet (1.7 m).

Nassau River enters Nassau Sound from the northwestward. A draft of 9 feet (2.7 m) can be carried up Nassau River at low tide for some 14 miles to the closed highway bridge. Small launches and tugboats navigate to the head of Nassau River, across Boggy Swamp, and up Mills and Thomas Creeks without difficulty at high tide. There are occasional sunken logs which are a menace to navigation. A highway bridge and the Seaboard Air Line Railway bridge, both closed, cross the river. There is a vertical clearance of 12 feet (3.7 m) at mean low water at the railroad bridge.

Nassauville is a small settlement on the north bank of Nassau River about 7 miles above the entrance. Small boats coming alongside the docks at Nassauville should exercise caution as the current forms an eddy with quite a pronounced whirlpool effect between the Wilder dock and the oyster cannery dock. There is a depth of 13 feet (4.0 m) at the Wilder dock.

Alligator Creek connects South Amelia River with Nassau River. A draft of 8 feet (2.4 m) can be carried through this creek at low tide but the channel is very tortuous and leads through a tidal flat between oyster bars which bare at low tide.

Pumpkin Hill Creek enters Nassau River from the east about 1 mile above Nassauville. There is a controlling depth of 9 feet (2.7 m) up Pumpkin Hill Creek to Edwards Creek, and 3 feet (0.9 m) for an additional 2 miles where the creek soon widens into numerous loops and tidal flats and bares at low water.

Edwards Creek connects Pumpkin Hill Creek with Nassau River. There is a controlling depth of 1 foot (0.3 m) at low tide. **Samples Creek** connects Edwards Creek with **Mink Creek.** The controlling depth through these creeks into Nassau River is ½ foot (0.2 m) at mean low water.

Sawpit Creek, which enters the sound from westward, connects with Gunnison Cut and Sister Creek, forming the inside route to St. Johns River. For detailed description of this passage, see Intracoastal Waterway Pilot, New York to Key West.

Simpson Creek connects Nassau Sound with Fort George Inlet. It can be navigated the entire distance at high tide by launches drawing less than 3 feet (0.9 m).

Little Talbot Island is a strip of low flat land about 4 miles in length and averaging about ¾ mile in width. It lies nearly in a north-and-south direction and is wooded along the outer coast but is marshy to the westward. By this strip of marsh, through which several creeks flow, it is separated from **Talbot Island**. This island is 4¼ miles in length by 1½ miles in width. It is partly wooded and partly marshy and is separated from the mainland by connecting streams, Sawpit Creek and **Gunnison Cut**. This last connects with **Fort George River** and **Sister Creek**, forming the **Intracoastal Waterway** passage from Nassau Sound to St. Johns River, through which there is a depth of 7 feet (2.1 m) at low water. Seen from seaward, Little Talbot Island shows a strip of dark woods with many conspicuous sand hills near the beach. Its south end runs off in a low point of bare sand bordering on Fort George Inlet.

Fort George Inlet is a narrow body of water separating **Little Talbot** and **Talbot Islands** from **Fort George Island**. The inlet changes rapidly, due to shifting sands at its entrance. It is unimportant and should never be used without local knowledge.

Fort George Island is immediately to the southward of Fort George Inlet. Its eastern shore, forming the coast line, shows a broad stretch of white sand beach, backed by a range of high sand hills. Near the north end of the island there is a conspicuous hill, called **Mount Cornelia**. It is 63 feet (19.2 m) high and thickly wooded. On clear days it may be seen from a distance of 12 to 15 miles, affording an excellent landmark for the entrance to St. Johns River. Fort George Island is separated from the mainland by a stretch of marsh, through which flows Sister Creek. There is a drawbridge across the mouth of Sister Creek. When approaching this bridge with a fair current, special care should be exercised, on account of the strong currents that occur here at times.

12. ST. JOHNS RIVER AND JACKSONVILLE

ST. JOHNS RIVER ENTRANCE TO JACKSONVILLE

(Chart 577)

St. Johns River, the largest and most important river of eastern Florida, is about 244 miles in length. It rises near the Atlantic coast, in about latitude 28°10′ N., flows in a northerly direction nearly parallel to the coast, and empties into the sea immediately north of St. Johns River Lighthouse, in latitude 30°24′ N. The river is the approach to the city of **Jacksonville** and a large number of towns and villages. The part of the river above Jacksonville is described under a separate heading.

The entrance of the river is between two converging jetties which extend out across the bar. The channel is under improvement to maintain a 30-foot (9.1 m) channel from the sea to Jacksonville, 300 feet wide on the straight reaches and widened at the turns and through the jetties to as much as 600 feet. In October 1935 the full center-line depth was available. There is constant dredging to

maintain the project to full dimensions. The channel is well marked by range lights and buoys. With these aids it is not difficult for a stranger of 20-foot (6.1 m) draft to navigate the river; all sailing vessels employ a towboat for crossing the bar and in the river as far as Jacksonville.

Mayport is a village on the south bank, 3 miles inside the entrance between the jetties. It has communication by rail, small craft, telephone, and telegraph with Jacksonville. The railroad wharf has burned, and there is now no commercial wharf of any size to which vessels can make fast. The United States engineers maintain a small wharf, not strongly constructed, to which mooring is forbidden without permission. At this wharf, fresh water may be obtained, but this water has sufficient sulphur content to require treatment with boiler compound before use. The depth of water at this wharf is 12 feet (3.6 m). Some supplies and gasoline can be obtained; also pilots for the Intracoastal Waterway.

Pilot Town is a village on the north bank opposite Mayport.

Prominent features.—Mount Cornelia, 63 feet (19.2 m) high and thickly wooded, is about 2 miles northward of the entrance. About 3¾ miles south of the entrance are the buildings of **Atlantic Beach**, and 3 miles southward of this beach is **Jacksonville Beach**, both summer resorts.

St. Johns River Lighthouse, lat. 30°23′36″ N., long. 81°25′34″ W., on the south side of the entrance, is a red brick, conical tower. The light has been discontinued.

St. Johns Lightship, lat. 30°23′ N., long. 81°18′ W., is located in a depth of 57 feet (17.4 m) on the prolongation of St. Johns Bar Cut Range line, St. Johns River Lighthouse bearing 271° true (W. ⅛ N. mag.), distant 6½ miles. The ship has a yellow hull, "**St. Johns**" on sides, two masts with a red cylindrical grating at each masthead, and shows a group flashing white light on one of the masts (3 flashes 2 seconds each, 2 eclipses 3 seconds each, 1 eclipse 8 seconds, every 20 seconds). The fog signal is an air tyfon sounding a 5-second blast every 30 seconds, silent 25 seconds. If the tyfon is disabled, a hand bell will sound groups of 3 strokes every 20 seconds.

A **radiobeacon** is operated on the lightship. When the fog signal is sounding, a group, a short and a long dash, 1 second and 5 seconds, is transmitted at end of minute period, coincident with the fog signal blast, for **distance finding.**

Pilots will come out to a vessel making a signal. The bar pilots keep a lookout for approaching vessels at the pilot station on the south side of the St. Johns River just inside the jetties. Up-river pilots can be obtained at Jacksonville. Pilots for the Intracoastal Waterway may be obtained at Mayport or Jacksonville. Bar pilotage is compulsory for certain vessels.

Pilotage.—Following are extracts from the rules and regulations:

1. The master of any vessel entering the port of Jacksonville who does not accept the services of a pilot shall be compelled to pay the full legal rates of pilotage.

7. Any pilot detained on board of any vessel by the master or quarantine officer shall receive for each and every day's services the sum of $5 per day over and above his pilotage.

The rates for pilotage from the sea to Jacksonville or vice versa are as follows:

Rates of pilotage

Draft	Pilotage	Draft	Pilotage	Draft	Pilotage
6 feet	$12.00	15 feet	$62.25	23 feet	$138.00
7 feet	15.75	15½ feet	65.13	23½ feet	141.00
8 feet	20.00	16 feet	68.00	24 feet	144.00
8½ feet	22.38	16½ feet	71.88	24½ feet	147.00
9 feet	24.75	17 feet	75.75	25 feet	150.00
9½ feet	27.88	17½ feet	79.28	25½ feet	153.00
10 feet	30.00	18 feet	82.80	26 feet	156.00
10½ feet	32.88	18½ feet	87.00	26½ feet	159.00
11 feet	35.75	19 feet	91.20	27 feet	162.00
11½ feet	38.88	19½ feet	95.60	27½ feet	165.00
12 feet	42.00	20 feet	100.00	28 feet	168.00
12½ feet	45.38	20½ feet	107.65	28½ feet	171.00
13 feet	48.75	21 feet	109.00	29 feet	174.00
13½ feet	52.38	21½ feet	112.00	29½ feet	177.00
14 feet	56.00	22 feet	125.00	30 feet	180.00
14½ feet	59.13	22½ feet	135.00	30½ feet	183.00

Moving, docking, shifting or taking from dock, per vessel, $10.
Two-thirds (2/3) pilotage rate will be charged per vessel seeking, making harbor for repairs or bunkers
Detention of pilots aboard vessels, $5 per day.
Delivering orders to vessels outside, $50.
Pilots carried away, when taking steamers to sea in bad weather or at night, $5 per day during absence and expenses back to Jacksonville, Fla.

Anchorages.—Vessels waiting outside the bar generally anchor, if the wind and sea are not too heavy, in the vicinity of *St. Johns Lighted Whistle Buoy 2 St. J.*; or they can anchor, in about 6 fathoms (10.9 m), about 3 miles northeastward of St. Johns River Lighthouse, with the end of the north jetty bearing about south.

The best and usual anchorage inside the mouth of the river is abreast Mayport, where a basin 800 feet wide with a least depth of 30 feet (9.1 m) has been dredged on the west side of the channel.

Anchorage is not permitted in the river at Jacksonville between Hogan Creek and the Florida East Coast Railway bridge, except for small craft on the south side of the river; large vessels can anchor below Hogan Creek. A good anchorage at Jacksonville for yachts is above the railroad bridge off Winter (Lancaster) Point.

Tides.—For tides at Mayport see the tide tables for the Atlantic Ocean, published annually in advance by the Coast and Geodetic Survey, in which the tides are predicted for every day of the current year. At the entrance between the jetties of St. Johns River the time of high and low water occurs about 20 minutes earlier than at Mayport. Proceeding up St. Johns River, the tide is later than at Mayport, the differences being approximately as follows: Fulton, 25 minutes; Dame Point, 50 minutes; Phoenix Park, 1 hour 10 minutes; Jacksonville (Hogan Street), 1 hour 45 minutes.

The approximate mean rise and fall of the time is as follows: Entrance between jetties, 5 feet (1.5 m); Mayport 4½ feet (1.4 m); Fulton, 3 feet (0.9 m); Dame Point, 2½ feet (0.8 m); Phoenix Park, 1½ feet (0.5 m); and Jacksonville (Hogan Street), 1 foot (0.3 m).

Currents.—There are strong tidal currents in St. Johns River as far up as Jacksonville. The currents at the entrance between the jetties require special attention. With northerly winds there is a strong southerly set on the flood at the end of the north jetty, and the conditions here are often dangerous, especially in heavy weather; in the event of a vessel becoming unmanageable, either by taking the

ground or a break in the steering gear, she is almost certain to be driven on one of the jetties. The mean velocities in the channel at the strength of the current are about as follows: Mayport, 2½ knots; New Berlin, 2 knots; Phoenix Park, 1½ knots; Jacksonville (off Washington Street), 2 knots. The velocity of the flood is increased by northeasterly and easterly winds, and the ebb by southwesterly and westerly winds.

Daily predictions of the times of slack water and the times and velocities of strength of flood and ebb in St. Johns River entrance are to be included in the Atlantic Coast Current Tables, beginning with the edition for the year 1936. Differences for obtaining predictions at other stations in the St. Johns River will be found in table 2 of this publication.

The tidal currents set in the direction of the channel, except on the crossing from Fulton to the mouth of Clapboard Creek, where there is some set on the ebb from the channel between Fulton and Le Barons Island, and on the flood into the sloughs northeastward of Le Barons Island.

DIRECTIONS, ST. JOHNS RIVER ENTRANCE TO JACKSONVILLE

The channel from sea to Jacksonville is a dredged cut from 300 to 600 feet wide, the tidal currents have considerable velocity, and strangers are advised to take a pilot. The ranges mentioned in the following directions mark the axis of the cut. Unless with a local pilot, vessels do not run the river at night; sailing vessels require a towboat.

The attention of mariners is called to the possible use of the courses (bearings) on the channel ranges in the river for a determination of the deviation of the compass on the various headings. The range marks are, however, sometimes shifted due to changes in the dredged channels; when such changes are made notice thereof is given in the "Notice to Mariners", and corrected true bearings are published in the annual "Light List."

In northeasterly gales there is generally a strong current setting southward across the entrance to the jetties. Vessels entering under such conditions must be prepared to counteract a sheer northward, as the bow enters under the north jetty, with the stern still under the influence of the cross current. Vessels have piled up on the jetty due to this condition.

Approach from northward.—(See caution on page 153.) From a position about 2 miles southeast of Savannah Lightship steer 199½° true (S. by W. ¾ W. mag.) for 97 miles to a position about 2 miles east of St. Johns Lightship. This course passes 7 miles offshore from *Brunswick Lighted Whistle Buoy 2 B*. From close aboard *Brunswick Lighted Buoy 2 B* a 188½° true (S. ¾ W. mag.) course made good for 37 miles will lead to a position about 2 miles east of St. Johns Lightship.

The principal danger in the northern approach to St. Johns River is the bar at the entrance of Nassau Sound, on which a number of vessels have been lost. In each case the vessel was standing in for the coast on a southwesterly course, obtained a sounding of over 9 fathoms (16.5 m) (high water) in the deep hole a short distance outside the bar, and stranded before obtaining another sounding.

A contributory cause for the disasters is the prevailing northerly current, which is felt until well inside the 10-fathom (18.3m) curve, except with northeasterly or northerly winds. The bar is marked off its northeast side by a nun buoy. St. Johns River is so well marked by the lightship, lighthouse, ranges, the jetties, and usually a number of vessels outside the bar that it is unnecessary to get in dangerously close to the coast to recognize the entrance.

From southward.—Approaching Cape Canaveral from southward the 15-fathom (27.4 m) curve is a good guide. Rounding Cape Canaveral in a depth of 15 fathoms (27.4 m) will lead about 15 miles off the light and in sight of it on a clear night. Passing about 3 miles eastward of *Hetzel Shoal Lighted Whistle Buoy 8* a 334° true (NNW. ¼ W. mag.) course made good for 117 miles will lead to a position 2 miles eastward of St. Johns Lightship; the course, if made good, leads within the limits of visibility of Ponce de Leon Inlet and St. Augustine Lights. On this course a set due to the prevailing current may be expected, except with northerly or northeasterly winds, of ½ to ¾ knot in a northerly direction parallel with the coast.

Broken ground with least depths of 5 to 6 fathoms (9.1 to 11.0 m) lies from 4 to 6 miles from the coast for a distance of 15 miles northward of St. Augustine Lighthouse. A shoal about 430 yards long in an east-and-west direction, with a least depth of 25 feet (7.6 m), exists on the southern side of the approach from the sea to the passage between the jetties. From the center of the shoal St. Johns River Lighthouse bears 270° true (W. mag), distant 3¼ miles. Deeper water is found between the shoal and the bank making off from St. Johns Point. With these exceptions the coast southward of St. Johns River is clear, and it is better to make the coast southward than northward of the entrance.

Bound southward from St. Johns River, vessels, except deep-draft ones, can avoid the northerly set due to the prevailing current by following the coast at a distance of about 3 miles to abreast Ponce de Leon Inlet Lighthouse, and then shaping the course to pass outside of *Hetzel Shoal Lighted Whistle Buoy 8.*

Courses and distances, St. Johns Lighted Whistle Buoy 2, St. J. to Jacksonville

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. St. Johns Lighted Whistle, Whistle Buoy 2 St. J. (Fl. W.), bearing N., dist. 200 yards. Steer St. Johns Bar Cut Range ahead (front light Fl. W., rear light F. W.; both daymarks white slatted, on skeleton structures):	°	*Points*	*Nautical miles*
Direct	276½	W. ½ N	4.3
Reverse	*96½*	*E. ½ S*	*4.3*

Courses and distances, St. Johns Lighted Whistle Buoy 2, St. J. to Jacksonville—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
2. Middle Ground Lighted Bell Buoy 1 (Fl. G.) bearing ESE. ¾ E., dist. 350 yards. Steer Pilot Town Cut Range astern (both lights F. R.; both daymarks white slatted, on skeleton structures):			
Direct	246	SW. by W. ¾ W.	0.6
Reverse	*66*	*NE. by E. ¾ E.*	*.6*
3. Mayport Cut Range Front Light (F. R.), bearing NNE., dist. 200 yards. Steer Mayport Cut Range (front light F. R., rear light F. W.; both daymarks red, square, slatted, on skeleton structures; rear range on St. Johns Bar Cut Range Rear Light Structure). This course leads 140 yds. off the docks at Mayport:			
Direct	203	SSW	.7
Reverse	*23*	*NNE*	*.7*
4. Stack at Mayport Pogie Plant, bearing S. ¾ W., dist. 600 yards. Steer Sherman Cut Range ahead (both lights F. G.; front daymark white, square, slatted, on unpainted pile structure, rear daymark white, rectangular slatted on skeleton structure):			
Direct	221½	SW. ⅜ S.	.5
Reverse	*41½*	*NE. ⅜ N.*	*.5*
5. Stack at Mayport Pogie Plant, bearing ENE. ½ E., dist. 600 yards. Steer Mile Point Lower Range ahead (both lights F. G.; front daymark black square with white stripe on skeleton structure, rear daymark rectangular, upper half black, lower half white, on skeleton structure):			
Direct	245½	SW. by W. ¾ W.	.3
Reverse	*65½*	*NE. by E. ¾ E.*	*.3*
6. Mile Point Lighted Buoy 10 (Fl. R.), bearing N., dist. 120 yards. Haul slowly NW. by W. keeping 200 yds. off training wall and come on Mile Point Upper Range astern:			
Direct	------	Various	.5
Reverse	------	*Various*	*.5*
7. East Coast Canal Light (F. G.; black square daymark in three-pile dolphin), bearing SW., dist. 190 yards. Steer Mile Point Upper Range astern (both lights F. G.; front daymark, black, square on skeleton structure, rear daymark white, black square center, on skeleton structure):			
Direct	309½	NW. ⅞ W.	.7
Reverse	*129½*	*SE. ⅞ E.*	*.7*

Courses and distances, St. Johns Lighted Whistle Buoy 2, St. J. to Jacksonville—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red, G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*) True	Magnetic	Distance
	°	*Points*	*Nautical miles*
8. **Drawbridge at mouth of Sister Creek,** bearing E. by N., dist. 600 yards. Steer Training Wall Range ahead (both lights F. R.; front daymark red square, on skeleton structure, rear daymark red slatted, on skeleton structure):			
Direct	306½	NW. ⅞ W.	0.5
Reverse	*126½*	*SE. ⅞ E.*	*.5*
9. **Short Cut Front Range Light** (F. R.), bearing E., dist. 360 yards. Steer Short Cut Range astern (both lights F. R.; front daymark white square, on pile structure, rear daymark white square on skeleton structure):			
Direct	271	W.	.4
Reverse	*91*	*E.*	*.4*
10. **Training Wall Front Range Light** (F. R.), bearing NE. by E., dist. 530 yards. Steer White Shells Cut Range astern (front light F. R., rear light F. W.; front daymark, red square, on skeleton structure, rear daymark, black with white round center, on skeleton structure):			
Direct	236½	SW. ⅞ W.	.6
Reverse	*56½*	*NE. ⅞ E.*	*.6*
11. **St. Johns Bluff Light 1** (F. G.; black square daymark on pile), bearing E., dist. 200 yards. Haul slowly to northwestward, pass 150 yds. off St. Johns Bluff Lt. No. 1 A. (F. G., black square daymark on pile) and Fulton Lt. (F. G., white rectangular daymark on skeleton structure):			
Direct		Various	.7
Reverse		*Various*	*.7*
12. **Fulton Light** (F. G.; white rectangular daymark on skeleton structure), bearing S. by E. ¾ E., dist. 250 yards. Steer Fulton Cut Range ahead (front light F. R., rear light F. W.; front daymark, red square, on skeleton structure, rear daymark, white square, black round center, on skeleton structure):			
Direct	341½	N. by W. ¾ W.	.8
Reverse	*161½*	*S. by E. ¾ E.*	*.8*
13. **Fulton Cut Range Front Light 6** (F. R.; red square daymark on skeleton structure), bearing N. by W. ¾ W., dist. 500 yards. Pass 160 yds. southwest of Lt. No. 6 and the training wall west of Clapboard Creek:			
Direct	321	NW. ½ N.	.3
Reverse	141	*SE. ½ S.*	.3

Courses and distances, St. Johns Lighted Whistle Buoy 2, St. J. to Jacksonville—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
14. **Fulton Cut Range Front Light 6** (F. R.; red square daymark on skeleton structure), bearing E., dist. 250 yards. Steer Browns Creek Cut Range ahead (front light F. R., rear light F. W.; front daymark red square on pyramidal structure, rear daymark, white slatted, black vertical stripe, on skeleton structure):			
Direct	300½	NW. by W. ⅜ W	1.0
Reverse	*120½*	*SE. by E. ⅜ E*	*1.0*
15. **Vick Island Light 3** (F. G.; black square daymark, white "3", on pile structure), bearing SW., dist. 200 yards. Haul slowly around southwestward, keeping about 200 yds. south of the shore line and come onto St. Charles Creek Cut Range astern:			
Direct	------	Various	.6
Reverse	------	*Various*	.6
16. **Vick Island Light 5A.** (F. G.; black square daymark on pile dolphin), bearing E., dist. 250 yards. Steer St. Charles Creek Cut Range astern (front light F. R., rear light F. W.; front daymark, red, square, slatted, on skeleton structure, rear daymark, white slatted, black square center, on skeleton structure):			
Direct	207½	SSW. ⅜ W	.5
Reverse	*27½*	*NNE. ⅜ E*	*.5*
17. **Vick Island Light 5A.** (described above), bearing NE. ½ N., dist. 1,160 yds. Steer Quarantine Island Lower Range ahead (both lights F. G.; front daymarks, square with black and white vertical stripes, on skeleton structure, rear daymark, black and white vertical stripes, on skeleton structure):			
Direct	198	S. by W. ½ W	.8
Reverse	*18*	*N. by E. ½ E*	*.8*
18. **Dame Point Light No. 12** (F. R.; red square daymark on 3-pile structure), bearing W., dist. 225 yards. Haul westward and northwestward around Dame Point in mid-channel, and come onto Quarantine Island Upper Range astern:			
Direct	------	Various	1.0
Reverse	------	*Various*	*1.0*
19. **Quarantine Island Range Upper Front Light** (F. G.; daymark black with white vertical stripe, on skeleton structure), bearing SE. ⅞ S., dist. 500 yards. Stee Quarantine Island Upper Range astern (both lights F. G.; front daymark black with white vertical stripe on skeleton structure, rear daymark, black and white vertical stripes on skeleton structure):			
Direct	326	NW. ⅞ N	.7
Reverse	*146*	*SE. ⅞ S*	.7

Courses and distances, St. Johns Lighted Whistle Buoy 2, St. J. to Jacksonville—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
20. **Petty Bank Light 11** (F. G.; black square daymark on pile structure), bearing W. by S., dist. 200 yards. Steer Brills Cut Range ahead (front light F. R., rear light F. W.; front daymark white square on pile structure, rear daymark, white slatted, black vertical stripe, on skeleton structure):			
Direct	316½	NW	0. 8
Reverse	*136½*	*SE*	*. 8*
21. **Curved Channel Light 11 A.** (F. G.; black rectangular daymark on 3-pile structure), bearing SSE., dist. 350 yards. Haul around southwestward, passing midway between Light No. 13 and Brills Cut Front Range Lt., and midway between Light No. 15 and Drummond Creek Front Range Lt.:			
Direct	------	Various	. 9
Reverse	------	*Various*	*. 9*
22. **Curved Channel Light 15** (F. G.; black square daymark on pile structure), bearing E., dist. 450 yards. Steer Drummond Creek Range astern (both lights F. R.; both daymarks white slatted, black vertical stripe, on skeleton structure):			
Direct	238½	SW. by W. ⅛ W	1. 5
Reverse	*58½*	*NE. by E. ⅛ E*	*1. 5*
23. **Trout Creek Range Front Light** (F. R.; white square daymark on pile structure), bearing N. by E. ⅜ E., dist. 300 yards. Steer Trout Creek range astern (front light F. R., rear light F. W.; front daymark, white square on pile structure; rear daymark, white, square, slatted, on skeleton structure):			
Direct	196½	S. by W. ⅜ W	1. 0
Reverse	*16½*	*N. by E. ⅜ E*	*1. 0*
24. **Six-Mile Creek Lighted Buoy 15 A.** (Fl. G.), bearing E. by N., dist. 75 yards. Haul around southeastward slowly, passing 100 yards off buoy no. 15 B and come onto Six-Mile Creek Cut Range ahead:			
Direct	------	Various	. 6
Reverse	------	*Various*	*. 6*
25. **Six-Mile Creek Lighted Buoy 15B** (Fl. G.), bearing N. dist. 150 yards. Steer Six-Mile Creek Cut Range ahead (front light F. G., rear light Fl. W.; front daymark, white, square, slatted, on skeleton structure; rear daymark, black square on skeleton structure):			
Direct	129	SE. ⅝ E	. 7
Reverse	*309*	*NW. ⅝ W*	*7*

Courses and distances, St. Johns Lighted Whistle Buoy 2, St. J. to Jacksonville—Continued

[Abbreviations: Lt., light; Bn., beacon; F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; G., green; Alt., alternating; t., true; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
26. **Six-Mile Creek Cut Range Front Light** (F. G.; white, square, slatted daymark on skeleton structure), bearing SE., dist. 200 yards. Steer City Limits Range ahead (both lights F. G.; front daymark, black square, white vertical stripe, on pile structure; rear daymark, black square, white vertical stripe, on skeleton structure):	°	*Points*	*Nautical miles*
Direct	177	S. ⅜ E	1. 1
Reverse	*357*	*N. ⅜ W*	*1. 1*
27. **Floral Bluff Lighted Buoy 18** (Fl. R.), bearing W., dist. 100 yards. Steer Arlington Cut Range astern (front light F. G., rear light Fl. W.; both daymarks, white, square, black vertical stripe, on skeleton structure):			
Direct	195	S. by W. ¼ W	1. 6
Reverse	*15*	*N. by E. ¼ E*	*1. 6*
28. **Arlington Creek Light 21 A.** (F. G.; black square daymark on pile structure), bearing NE. ⅞ N., dist. 400 yards. Steer midchannel courses past the wharves:			
Direct	------	Various	2. 5
Reverse	------	*Various*	*2. 5*
29. **Florida East Coast Railway drawbridge.**			

PORT OF JACKSONVILLE

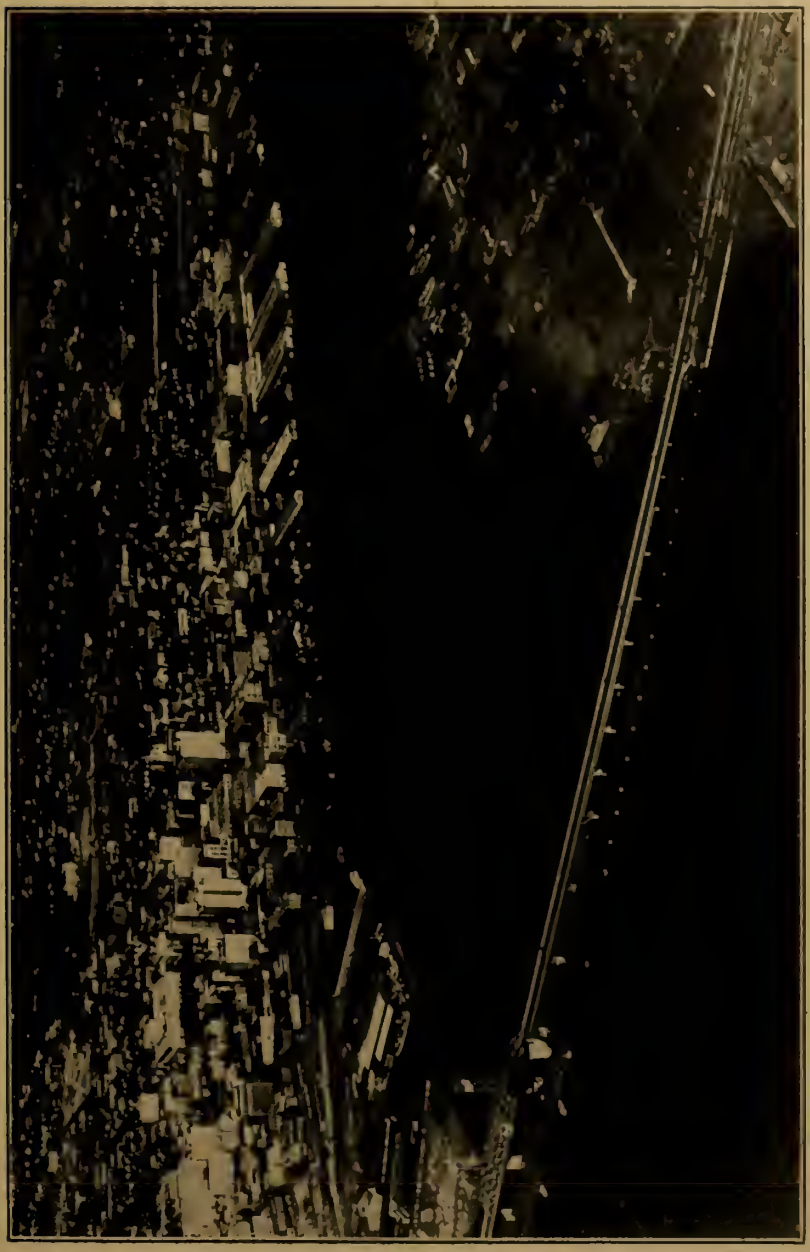
Jacksonville.—The largest city and most important port of the State of Florida is located on the north bank of the St. Johns River, about 24 miles above the entrance between the jetties. The population in 1930 was 129,549. The climate is such that the winters are mild and temperate, free from extreme cold, and the summers are tempered by sea breezes from the Atlantic Ocean.

The city of Jacksonville is an important railway center and distributing point, with numerous steamship lines operating to all coastwise points and Pacific and foreign ports. There is also considerable traffic with up-river points and along the Intracoastal Waterway.

The principal exports are lumber, naval stores, metal scrap, and citrus fruits. The principal imports are crude oil, gasoline, fertilizer materials, and coffee.

The city is the principal distributing point for supplies of all descriptions to the State of Florida and to the adjacent sections of southern Georgia.

Quarantine.—The quarantine office is now located on the municipal docks at Jacksonville. The anchorage is on the east side of the channel, north of the Six Mile Creek front range beacon. Vessels are boarded in the river, abreast the municipal docks.



Jacksonville, Fla., from south-southwestward.

Pilots and pilotage.—For information concerning pilots and pilotage rates, see page 216.

Terminal facilities.—The harbor embraces the entire river from a point 2 miles below the city to a point 2 miles above it. There are 75 wharves and piers in Jacksonville in addition to the municipal docks and terminals composed of three piers which are operated by the city of Jacksonville. Twelve of the piers are owned by the major rail lines, four by steamship lines, three by the city of Jacksonville, and the remainder by private corporations or individuals. Of the privately owned piers those of the Commodores Point Terminal Company are the largest, having a 5,000-foot berthing space parallel to the channel.

The depth of water at the principal piers ranges from 18 to 30 feet (5.5 to 9.1 m). Good rail and highway connections are available along the entire water front. The municipal terminals are supplemented by a cotton warehouse and compress and are equipped with mechanical freight-handling devices.

Supplies.—Provisions can be obtained at Jacksonville and Mayport. Ship chandler's stores, anthracite and bituminous coal, gasoline, fuel oil, and water can be obtained alongside the wharves at Jacksonville. Water can be obtained by vessels of moderate draft at the United States Engineer's wharf at Mayport.

Repairs.—There are a number of drydocks and marine railways. The dimensions of the largest dock are: Length, 330 feet; width, 65 feet; depth over sill, 20 feet (6.1 m); capacity, 4,500 tons. The facilities for repairs to vessels and machinery of steamers and yachts are excellent.

Towboats are obtainable at Jacksonville for towing up river, down river, to nearby ports, or at sea.

Communications.—The port is reached by five railroad lines and is also served by three terminal companies. The railroads are the Atlantic Coast Line Railroad, the Seaboard Air Line Railway, the Southern Railway, the Georgia, Southern & Florida Railway, and the Florida East Coast Railway.

There are numerous steamship lines which connect with all the principal ports on the Atlantic, Gulf, and Pacific coasts, as well as with the principal foreign ports.

Bus and truck systems operate over the excellent highways which reach the city. There are also air transportation facilities and telephone, telegraph, and radio communications.

Aviation fields.—**Jacksonville Airport**, municipally owned, is 7 miles north of the business center of the city. It has three surfaced runways, and one graded, all 2,500 by 100 feet. There are facilities for servicing aircraft, day and night.

Camp J. Clifford R. Foster is an auxiliary field, 12 miles south of Jacksonville, west of the St. Johns River. There are two landing strips, 1,785 by 300 feet and 1,500 by 285 feet. There are no servicing facilities.

Storm warnings are displayed at Jacksonville from the Graham Building (one of the tallest buildings) and are visible from the river.

United States Public Health Service.—The nearest marine hospital is at Savannah. There is a relief station of the United States Public Health Service at Jacksonville.

ST. JOHNS RIVER ABOVE JACKSONVILLE

(Charts 682, 683, 684, 508, 509, and 458)

Between **Jacksonville and Lake Harney**, a distance of 163 miles (all distances are nautical miles), the river has been improved by dredging. The present head of steamboat navigation is Lake Harney, although small boats have navigated the river as far as Lake Washington, 216 miles above Jacksonville. In June 1935 the controlling depths were as follows: **Jacksonville to Palatka**, 13 feet (3.9 m); **Palatka to Sanford**, 8 feet (2.4 m); **Sanford to Lake Harney**, 3 feet (0.9 m).

Steamers make regular trips on the river between Jacksonville and Sanford. The principal traffic is in citrus fruits, produce, lumber, and general merchandise. Vessels occasionally load lumber at Palatka.

The route to Sanford is well marked by lights and beacons and is comparatively easy to navigate with the aid of the charts. Some local knowledge is required above Palatka to secure the best water. In the upper part the river is narrow and tortuous in places, and some difficulty may be experienced in making some of the bends. Cut-offs are now being dredged to eliminate some of the worst of these bends. The river is partly obstructed by hyacinths at certain times during the year, and floating snags are a continual menace to navigation. The snags and overhanging trees are periodically removed by the snag boats of the United States Engineers. This was last done in 1934. The unimproved creeks tributary to the St. Johns River are apt to be obstructed by logs and hyacinths.

Pilots for the river and its tributaries can be obtained at Jacksonville, Palatka, and Sanford.

There are numerous landings on the river, some of which are winter resorts, and others are centers of farming districts and orange groves. The more important places are Orange Park, Green Cove Springs, Palatka, Welaka, Georgetown, Astor, and Sanford.

The river is crossed by seven drawbridges. The least width of clear span through the draws is 90 feet (27.4 m). Several aerial wire crossings span the river. The minimum clearance under these is 77 feet (23.5 m) at mean high water.

Tides.—From Jacksonville to Palatka the mean rise and fall of tide is about 1 foot (0.3 m) while at the mouth of Dunns Creek and Oklawaha River it is about 1 foot (0.3 m) and ½ foot (0.15 m) respectively, and diminishes in passing up these streams. At low-water stages tidal action is felt to Lake George.

The tidal currents have little velocity above Jacksonville. The winds have considerable effect on the water level and velocity of the currents. Strong northerly and northeasterly winds raise the water level about 2 feet (0.6 m) at Jacksonville, about 1 foot (0.3 m) at Palatka, and about 1½ feet (0.4 m) at the mouth of Dunns Creek. Strong southerly and southwesterly winds lower the water level about 1 to 1½ feet (0.3 to 0.4 m), increases the velocity of the ebb, and decreases or may interrupt the flood. The currents in Deep Creek are very sluggish, being due primarily to the winds and tide. There is a moderately rapid run-off or hydraulic current

in the Oklawaha River. The wind has no appreciable effect on the water level at the head of Dunns Creek and in Lake Crescent.

The flood stages in the river usually occur during the fall months and are about 1 foot (0.3 m) above ordinary low-water level at Jacksonville, 2 feet (0.6 m) at Palatka, 3 feet (0.9 m) at Lake George, 5 feet (1.5 m) at Sanford, and 6½ feet (1.9 m) at Lake Harney.

The river water may be fresh at Jacksonville at low water with westerly winds, while with northeasterly winds brackish water may extend up to Doctors Lake.

JACKSONVILLE TO PALATKA

(Charts 682, 683, and 684)

The distance to **Palatka** is 48 miles, and the controlling depth 13 feet (3.9 m).

There are two bridges at Jacksonville at Hendricks Point. The highway bridge (vertical lift) has a vertical clearance at mean high water of 58.5 feet (17.8 m) minimum, and 166.5 feet (50.8 m) maximum. The railroad bridge (single-leaf bascule) alongside has a vertical clearance of 9.2 feet (2.8 m) when closed. The horizontal clearance of both bridges is 185 feet (56.4 m).

Ortega River, 3 miles above the Florida East Coast Railway bridge at Jacksonville, is crossed by two drawbridges near its mouth. The first one, a highway bridge, has a double-leaf bascule draw span, 53-foot horizontal clearance when open and 10-foot (3.0 m) vertical clearance when closed (at mean low water). The second is the Atlantic Coast Line Railroad bridge, which has a single-leaf bascule draw span, 40-foot horizontal clearance when open and 3.2-foot (1.0 m) vertical clearance when closed (at mean low water). A draft of about 5 feet (1.5 m) can be taken across the bar above the bridges into the narrower part of the creek.

Orange Park, about 10 miles above Jacksonville, on the west bank of the river, is a winter resort, and the site of "Moose Haven", a home for the aged. The principal dock supports a sewer outfall and has only 2 feet (0.6 m) at mean low water at its outer end.

Doctors Lake, 11 miles above Jacksonville, has a depth of 7 to 8 feet (2.1 to 2.4 m) in the entrance and is occasionally used as a freshwater anchorage. At the entrance is a highway-bridge crossing. This bridge has a swing draw span, with 60-foot horizontal clearance when open and 8-foot (2.4 m) vertical clearance when closed (at mean low water). A sunken barge, 460 feet SSW. ⅜ W. from the center of the draw is awash at low water. Vessels should not anchor in this vicinity. There is a small marine railway in Doctors Lake which can haul out boats of 45 feet (13.7 m) length, and 4 feet (1.2 m) draft.

Julington Creek, 13 miles above Jacksonville, has a least depth of 5 feet (1.5 m) for a distance of 3 miles to the forks, and the same depth can be taken about 3 miles up both branches. This creek is crossed by a highway bridge about a mile inside from the entrance. The bridge is a fixed span, with 39-foot horizontal clearance and 11½-foot (3.4 m) vertical clearance (at mean low water).

Black Creek, 18 miles above Jacksonville, is navigable for vessels of 8-foot (2.4 m) draft about 15 miles to the village of **Middleburg**. The creek just inside its entrance is crossed by a drawbridge.

Green Cove Springs, a village on the west bank of the St. Johns River, about 20 miles above Jacksonville, is a winter resort. The wharves of the sawmills which formerly operated here are now in ruins. There is a good municipal dock with a depth of 7½ feet (2.3 m) along its face. There is fresh water on the dock. Gasoline and supplies can be secured in the town.

A highway bridge crosses the St. Johns River about 2 miles above Green Cove Springs, at Old Field Point. It has a single-leaf bascule draw span with horizontal clearance of 100 feet, when open. When closed it has a vertical clearance of 10 feet (3.0 m) above mean low water.

Trout Creek and **Six Mile Creek** have a common entrance about 24 miles above Jacksonville. These creeks are navigable about 3 or 4 miles for boats of 6-foot (1.8 m) or less draft.

Tocoi is a small settlement on the east bank about 31 miles above Jacksonville. There are several small docks and gasoline can be obtained.

Deep Creek, 36 miles above Jacksonville, is navigable for a draft of 7 feet (2.1 m) for a distance of about 4 miles to Hastings, a town on the railroad. Several very sharp bends in this creek interfere with navigation. In June 1933 the controlling depth in the dredged entrance channel to Deep Creek was 7¾ feet (2.3 m).

Rice Creek, 44 miles above Jacksonville, is navigable for small craft of 6-foot (1.8 m) or less draft about 5 miles to the forks and a short distance up both branches. Two drawbridges cross the creek a short distance above its mouth.

Palatka, population 6,500 in 1930, is an important town and railroad center on the St. Johns River, 48 miles above Jacksonville. There are good facilities for the transfer of freight between rail and water. Four freight-boat lines operate to Jacksonville and up-river to Sanford. Lumber, ties, and citrus fruits are shipped. There are large sawmills, one of which has a vertical lift dock capable of taking out vessels 125 feet (38.1 m) in length, and 8-foot (2.4 m) draft. There is a yacht storage house in Palatka with a marine railway capable of handling vessels of 100 tons, 85-foot (25.9 m) length, and 6-foot (1.8 m) draft. There is a machine shop in Palatka. Gasoline, Diesel oil, supplies, and fresh water can be obtained, and coal in quantities when prearranged for.

The depths at the commercial wharves above the bridge are 10 feet (3.0 m) and 16 feet (4.9 m) at the north and south docks respectively, and a channel with a controlling depth of 13 feet (4.0 m) leads to them. The city dock, the uncovered wharf to the south of them, has a depth of 11 feet (3.4 m) at the north face, 9 feet (2.7 m) at the east face, and fresh water connection. The depth at the dock at the lumber mill is 7 feet (2.1 m).

Two bridges cross the St. Johns River at Palatka. The first one is the Florida East Coast Railway bridge. It has a swing draw span with horizontal clearance of 98 feet (29.9 m) when opened. When closed the vertical clearance is 3½ feet (1.1 m) at mean low

water. The new highway bridge is about 200 yards above the railroad bridge. It has a single-leaf bascule draw span with a horizontal clearance of 101 feet (30.8 m) when open. When closed the vertical clearance is 22½ feet (6.9 m) at mean low water.

DIRECTIONS, JACKSONVILLE TO PALATKA

This part of the river is comparatively easy to navigate with the aid of the charts.

After coming through the draws at Jacksonville keep about 150 yards off the starboard bank for ⅞ mile until abeam of **Winter Point.**

There is a large shoal with a least depth of 3 feet (0.9 m) in midriver southeast of Winter Point. Lights no. 32 and no. 34 mark this shoal. River boats use the channel east of the shoal passing about 150 yards east of light no. 32 and 350 yards east of light no. 34 on a course of 181° true (S. mag.) heading for a point about 100 yards west of Phillips Point Light No. 25. There is a controlling depth of 12 feet (3.7 m) in the east channel, and 15 feet (4.6 m) in the west channel.

From a position 150 yards east of Winter Point steer 180° true (S. ⅛ E. mag.) for 1 mile to a position about 900 yards SW¼S of light no. 34.

Then make good a course of 163½° true (S. by E. ½ E. mag.) for 4.2 miles, passing about 350 yards off Phillips Point Light No. 25, to a position about 400 yards east of Piney Point Light No. 36.

Change course to 185½° true (S. ⅜ W. mag.) and continue on course for 1.7 miles to a position 400 yards west of Buckley Bluff Light No. 27.

Haul southwestward and, with the tall elevated tank on **Christophers Point** astern, steer 214° true (SSW. ⅞ W. mag.) for 2½ miles until the end of the dock at **Orange Park** bears west, distant about 850 yards. Thence haul southward and steer 175° true (S. ½ E. mag.) for 2¾ miles, passing about 500 yards west of Mandarin Point Light No. 29, north-northwest of **Mandarin Point,** to a position about 200 yards east of Ragged Point Light No. 40.

From a position 200 yards east of Ragged Point Light No. 40 steer 180° true (S. ⅛ E. mag.) for 3½ miles to a point about 500 yards west of Switzerland Point Light No. 31 off **New Switzerland Point.** This course heads for a prominent white house on the west shore of the St. Johns River and shows slightly to the eastward of the prominent elevated tank in **Green Cove Springs.**

Continue on course for 1¾ miles to a position about 0.7 mile northwest of Popo Point Light No. 33. Then change course to 151° true (SSE. ⅝ E. mag.) and continue on course for 1.9 miles, passing about 400 yards southwest of Popo Point Light No. 33, to a position about 300 yards northeast of Green Cove Springs Light No. 50. Then stand for the center of the draw of **Shands Bridge,** 21 miles above Jacksonville, on course 124½° true (SE. by E. mag.) for 1.9 miles.

The counterweight of the bascule-type draw is an excellent landmark. The horizontal clearance through the draw is 102 feet (31.1 m); the vertical clearance when closed is 11 feet (3.4 m) at mean low water.

From the center of the draw steer 116½° true (SE. by E. ¾ E. mag.) for 1.3 miles to a position 400 yards east of Red Bay Point Light No. 54; thence steer 168° true (S. by E. ⅛ E. mag.) for 2.2 miles to a position 200 yards east of Bayard Point Light No. 56. On this course a prominent lone tree on **Picolata Point** is slightly on the port bow.

From a position 200 yards east of Bayard Point Light No. 56 steer 190° true (S. ¾ W. mag.) for 1.1 miles to a position 200 yards west of Picolata Flat Light No. 37.

Make good a course of 166° true (S. by E. ⅜ E. mag.) for 3 miles, passing about 150 yards west of Orange Point Beacon No. 39, to a position about 100 yards west of Tocoi Cut Range Rear Light No. 41.

Then change course to 160° true (S. by E. ⅞ E. mag.), pass 100 yards west of Tocoi Cut Range Front Light No. 43 and immediately haul to close Tocoi Cut range astern (front light Fl. W., rear light F. W.; front beacon white square pile structure, rear beacon white daymark on square pile structure) on course 160° true (S. by E. ⅞ E. mag.).

Hold this range for 3 miles through Tocoi Cut to a position about 30 yards west of Tocoi Cut Entrance Light No. 43A. The controlling depth through the cut is 13 feet (4.0 m).

From a position 30 yards west of Tocoi Cut Entrance Light No. 43A. steer 148½° true (SSE. ⅞ E. mag.) for 1⅜ miles to a position about 100 yards south of Racy Point Cut Range Front Light No. 47.

Close the Racy Point Cut range astern (front light Fl. W., rear light F. W.; both daymarks, white square, on pile structures) and steer 181½° true (S. mag.) through Racy Point Cut.

Continue on course for 3¼ miles, passing about 250 yards west of Federal Point Light No. 49, and then enter the dredged cut on a course of 195° true (S. by W. ¼ W. mag.) for ¼ mile to a position about 50 yards east of Nine-Mile Flat Light No. 60.

Haul slightly westward and, with Dancey Point range ahead (front light Fl. W., rear light F. W.; front daymark, black square, on pile structure, rear daymark, white, slatted, on square, pile structure), steer 220½° true (SW. ½ S. mag.) for 2⅛ miles to a point about 200 yards from Daucey Point Range Front Light No. 53.

Veer to westward and steer 271° true (W. mag.) for 2.4 miles, passing about 200 yards north of Forrester Point Light No. 51A, to a position 400 yards (SE. ⅝ E.) from Forrester Point Lower Range Rear Light. Then head to pass about 50 yards southeast of Forrester Point Lower Range Front Light No. 62.

Haul to southward and close Forrester Pont Lower range astern (front light Fl. W., rear light F. W.; front daymark, black square, on pile structure, rear daymark, red square, on skeleton structure). Continue on course 199° true (S. by W. ⅝ W. mag.) for ¾ mile.

Veer to close Forrester Point Middle range astern (front light Fl. W., rear light F. W.; front daymark, red square, on pile structure, rear daymark, white square, on skeleton structure) passing about 50 yards off Forrester Point Middle Range Front Light No. 64.

With Forrester Point Middle range astern steer 173° true (S. ¾ E. mag.) for 0.6 mile, then haul southeastward to close Forrester Point Upper range astern, passing about 50 yards off Forrester Point Upper Range Front Light No. 66.

With Forrester Point Upper range astern (from light Fl. W., rear light F. W.; front daymark, red square, on pile structure, rear daymark, white square, on skeleton structure) steer 152° true (SSE. ⅝ E. mag.) for 1 mile; then favor the east bank of the river for about ¾ mile to a point about 200 yards west of the dock on the west side of **One Mile Point** (Moritani Point).

Thence steer 186° true (S. ½ W. mag.) for ½ mile to pass about 150 yards east of Lower Palatka Light No. 68; then head for the center of the railroad draw at Palatka.

Pass through the draws of the railway and highway bridges which cross the river at Palatka. The first of these has a swing-type draw with a horizontal clearance of 98 feet (29.9 m), and a vertical clearance of about 3½ feet (1.1 m) at mean low water when closed. The openings adjacent to the swing span have a vertical clearance of 5.8 feet (1.8 m) at mean low water and a horizontal clearance of 8.7 feet (2.7 m). The highway brdge has a double leaf, bascule-type draw, with a horizontal clearance of 101 feet (30.8 m) and a vertical clearance of 22½ feet (6.9 m) at mean low water when closed.

The docks at Palatka lie southward of the bridges.

PALATKA TO SANFORD

(Charts 508 and 509)

The distance from Palatka to Sanford is 90 miles, and the controlling depth 8 feet (2.4 m).

The route, which is interesting and scenic, follows the **St. Johns River** and crosses **Little Lake George, Lake George, Lake Dexter,** the south end of **Lake Beresford,** and the west end of **Lake Monroe.**

At certain times of the year great masses of hyacinths are found in the river above Palatka but a channel is usually kept clear through them by the river boats operating to Sanford. Floating logs and snags are frequently encountered in this section of the waterway.

Dunns Creek, 6½ miles above Palatka, is navigable for boats of 7-foot (2.1 m) draft to **Crescent Lake,** a distance of 7½ miles. Some of the bends in the creek are sharp.

Directions.—From the St. Johns River the creek should be entered from a point northeast of its mouth, passing about 50 yards off the fish traps on the east side of the entrance. The eastern entrance of **Polly Creek** lies just to the west of the mouth of Dunns Creek and care should be taken not to confuse the two.

Keep within 50 yards of the west bank for ½ mile, passing the mouth of **Murphys Creek** which lies to starboard and **Cross Creek** which lies to port.

One-quarter mile beyond pass through the draw of the highway bridge. The southwest opening has the deeper channel. The draw is a swing span with a horizontal clearance of 60 feet (18.3 m) and a vertical clearance of 11 feet (3.4 m) at mean high water when closed.

Having come through the draw, follow in midchannel for about ½ mile and round a bend to the south. Favor the west shore slightly and round a bend to the east.

Favor the south bank until within 300 yards of the next sharp bend where the north bank should be followed closely to avoid a 5½-foot (1.7 m) shoal in midstream northwest of the point on the south bank.

When this point is abeam, follow around the bend in midchannel and keep close to the west bank for 200 yards to the next sharp turn to the northeast. Favor the south and east bank until midway to the next point. Cross to the west bank and follow a row of old pilings to the next bend at **Horse Landing**.

Pass the small wharf on the north shore in midstream and favor the west bank to the next bend. Round the turn in midchannel, hauling slowly over to the north bank before reaching the next sharp bend to the south. Keep well over toward the west bank to avoid a 2-foot (0.6 m) shoal in midstream in the short reach to the south.

Continue to follow the outside of 11 bends for about two miles until about ½ mile below **Piney Bluff Landing**. A 5-foot (1.5 m) shoal lies in midstream 150 yards north of the point. The shoal can be avoided by following close to the west bank.

Immediately above **Piney Bluff Landing** pass to the south of the small island in midstream and to the west of the next island about 450 yards beyond.

There is a large shoal which has a least depth of 7 feet (2.1 m) in midstream just beyond the next turn above the second island. Deeper water will be found close to either bank.

At the entrance to **Crescent Lake** pass about 50 yards to the west of Dunn Creek Bar Light No. 1. Haul to the southeast and pass about 50 yards to the east of Dunn Creek Bar Light No. 2. A depth of 7 feet (2.1 m) will be encountered between these two lights.

Crescent Lake is about 11 miles long and has a maximum width of about 2 miles. The general depth is between 12 and 15 feet (3.7 and 4.6 m), gradually shoaling toward shore. There are no periodic tides in the lake, the range in Dunns Creek becoming zero near its end. Sudden squalls in the lake cause a chop dangerous to small boats.

Crescent City is on the west side of the lake about 6½ miles from the north end. There are several small wharves used by fishing boats and a protected basin for small pleasure craft. The town has railroad communication and supplies, ice and gasoline can be obtained. There is a marine railway for small craft.

There is a mole and a small slip on the eastern shore of Crescent Lake at **Shell Bluff** where railroad ties are loaded on barges to be towed to Palatka and Jacksonville.

A depth of 5 feet (1.5 m) can be taken into **Haw Creek** at the head of Crescent Lake.

Directions.—From a position about 50 yards east of Dunn Creek Bar Light No. 2 steer 151° true (SSE. ⅝ E. mag.) for 3.3 miles to pass 100 yards to the east of Weidenoch Point Light No. 4. Continue on course for 1.2 miles to Carls Point Light No. 6.

Pass 100 yards east of the light and steer 160° true (S. by E. ⅞ E. mag.) for 1 mile until the next point is reached. Then follow the

west shore of the lake at a distance of about 400 yards to **Crescent City.**

A drawbridge with a clear opening 89 feet wide crosses the river at Buffalo Bluff, 9¾ miles above Palatka.

Welaka is a village on the east side of the river 18 miles above Palatka. Gasoline and fresh water can be secured at the docks. There is a depth of 9 feet (2.7 m) at the face of the docks. The village has telephone, telegraph, and surfaced road connections and two hotels. Supplies are obtainable. There is a small marine railway capable of hauling out small fishing boats. Local fishermen capable of rendering pilot service to **Silver Springs** and **Eustis** can be found here.

Oklawaha River has its source in the system of large lakes in the central part of the peninsula of Florida and flows in a general northerly direction, then eastwardly, emptying into the St. Johns River 22 miles above Palatka. The extreme head of the system may be taken as **Lake Apopka,** 120 miles above the mouth of the river.

The river is extremely tortuous and obstructed by shoals, and the upper part above Silver Springs Run by hyacinths and eel grass. Improvements are in progress to obtain a channel 5 feet (1.8 m) deep for a distance of 46 miles from St. Johns River to the mouth of **Silver Springs Run** and 6 miles up the latter to the village of **Silver Springs,** 4 feet (1.2 m) deep from the mouth of Silver Springs Run to **Leesburg,** 87 miles from St. Johns River, which is the head of steamboat navigation, and the construction of a lock and dam at **Moss Bluff** to retain the water level in **Lake Griffin.** The lock and dam were completed in 1925.

In 1935, the controlling depths at extreme low stages were 3.8 feet (1.2 m) from the mouth of the river to Silver Springs Run, thence 1.5 feet (0.4 m) to Moss Bluff, thence 4 feet (1.2 m) to Starkes Ferry, and thence 3 feet (0.9 m) to Leesburg.

Snags are liable to be encountered by boats. Leesburg and Silver Springs have railroad communication. There is a downstream current in the river of about 1 knot. A pilot for the river can be obtained at Palatka, East Palatka, and sometimes at Welaka.

Georgetown is a post office and village on the east bank of the river at the north end of Lake George. Gasoline and fresh water can be secured at the two good wharves. There is a marine railway capable of hauling out small fishing boats.

Astor is a village with railroad communication 5 miles above Lake George and 42½ miles above Palatka. Gasoline and some provisions are obtainable here, but there are no docks at which a boat can lie. A highway bridge crosses the river at Astor. The draw span is a hand-moved swing truss with a horizontal clearance of 90 feet on either side of the central pier. The vertical clearance, closed, is 9½ feet (2.8 m) at mean low water.

DeLand Landing, 15 miles above Astor and 20 miles above Lake George, is the river landing for **DeLand,** a city of a population of 5,246, 2 miles to the eastward. There is a good dock at the landing and fresh water and gasoline are obtainable. There is paved road connection to DeLand.

Beresford is a small village and landing at the north end of Lake Beresford. It is reported that a draft of 6 feet (1.8 m) can be taken to the dock.

Wekiva River, 75 miles above Palatka, is reported navigable for boats of 4-foot (1.2 m) draft for a distance of about 2 miles above its mouth, and of 2-foot (0.6 m) draft to **Wekiva Spring**, a winter resort 15 miles above the mouth. The river is little used. Two bridges of fixed span cross the river. The highway bridge, 7 miles from the St. Johns River, has a horizontal clearance of 25 feet (7.6 m), and a vertical clearance of 12 feet (3.7 m) at mean high water. The Atlantic Coast Line Railway bridge, 1 mile beyond the highway bridge, has a horizontal clearance of 40 feet (12.2 m) and a vertical clearance of 15 feet (4.6 m) at mean high water.

Sanford, with a population of 10,100 in 1930, is an important town and railroad center on the south side of Lake Monroe and in the heart of the Florida celery district. Four river-steamer lines operate between Sanford and Jacksonville, with daily connection. Celery and citrus fruits are shipped in great quantities. Provisions, ice, gasoline, and Diesel oil are obtainable at Sanford. Excellent hotel accommodations are available. There is an excellent city dock with a depth of 8 feet (2.4 m) at its face. Greater depths are found at the commercial docks. Fresh water is obtainable at the city dock and the commercial docks.

There are no facilities for hauling out or repairing boats in Sanford, but there is a small boat-repair yard and yacht storage house in the river about three miles east of Sanford and above Lake Monroe. There is a vertical lift dock capable of handling from 50 to 65 tons and a draft of 6 feet (1.8 m). There is paved-road connection between this yard and Sanford. Yachts intending to remain some time at Sanford usually lie here to avoid the rough water of Lake Monroe along the face of the docks.

DIRECTIONS, PALATKA TO SANFORD (LAKE MONROE)

The river is not difficult to navigate and should be fairly easy to the stranger if care is exercised and attention paid to the chart and to these directions.

Continue on course through the bridges for 250 yards and then haul to the southeastward and steer 146° true (SE. ⅞ S. mag.) for ½ mile, passing 250 yards northeast of Upper Palatka Light No. 70. When this light comes on range with a large dome-shaped incinerator to the west, haul to eastward and steer 108° true (ESE. ½ E. mag.) for ⅜ mile passing 100 yards south of a shoal marked by two fish traps. Continue on course until Devils Elbow Light No. 72 is abeam, distant 150 yards.

Then change course to 54° true (NE. ¾ E. mag.) for ⅜ mile until within 100 yards of the north bank. Keep this distance off shore around **Devils Elbow** and past the docks at **East Palatka**. There is a small lumber mill at East Palatka.

An 11-foot (3.4 m) shoal is found in midstream opposite the mouth of **Mill Branch** which enters from the east. The shoal can be

avoided by favoring the row of piling on the northeast side of the river.

Favor the east bank and past midway between Rawlestown Light No. 74 and the east shore. The aerial wire crossing at **Rollestown**, 2¼ miles above Palatka, has a vertical clearance of 160 feet (49 m) at mean low water.

Round Rawlestown Light No. 74 and favor the west bank at a distance of 200 yards for ½ mile to avoid the 8-foot (2.4 m) shoal in midstream. After rounding the curve to the left, stand in midstream and pass about 150 yards eastward of San Mateo Light No. 76.

The controlling depth of the next section of the river to **Turkey Island** is 9 feet (2.7 m) at mean low water and this depth is found in several places.

Rounding San Mateo Light No. 76, haul south-southwestward to pass about 100 yards off the docks at the south end of **San Mateo**; then favor the south shore for a distance of 1½ miles, passing about 150 yards northwestward of Edgewater Grove Light No. 55 at **Edgewater**, until abeam of the mouth of **Cross Creek**, the first stream opening on the south side; then haul to pass about 150 yards off the point on the north shore, and then steer to pass about 50 yards south of Crescent Lake Light No. 78.

Haul slowly to the northwest and pass about 50 yards off the ruins of an old wharf on the north shore. A shoal, with a least depth of 8 feet (2.4 m) at mean low water, makes out from the south bank opposite this wharf for a distance of 250 yards.

When about 100 yards past the ruined wharf haul sharply to the west and pass about 50 yards south of Horseshoe Light No. 80. Haul slowly to the northwest to pass about midway between Murphy Island Light No. 57 and the shore to the northeastward.

Favor the bend for about 100 yards and then haul southwestward to pass about 100 yards of the west side of the point on the north shore of **Murphys Island** and favor that shore until beyond the small docks.

When south of **Horse Shoe Point**, haul to the north shore and follow it around the curve at a distance of about 100 yards, passing about 100 yards northward of Murphy Island South Light No. 59. Continue until about 300 yards west of a fish house and some stakes to the southward of it.

There is an old wreck of a river boat near the shore 430 yards southwestward of Murphy Island South Light No. 59 and to the eastward of a small wooded island. Keep 100 yards to the westward of this island and the same distance off the south and east shore and passing Murphy Island Light No. 80A at distance of about 100 yards. This light stands on the southeast side of a shoal in midriver. There is a least depth of 1 foot (0.3 m) on the shoal at mean low water. There is a small lumber mill on the west bank of **Murphys Creek** just inside the mouth.

When about 200 yards beyond Murphy Island Light No. 80A, and about half way to the mouth of **Murphys Creek**, haul to the north shore again and follow it at a distance of about 100 yards to the draw of the railroad bridge at **Buffalo Bluff**. This bridge has a swing type draw through which the horizontal clearance in the north open-

ing is 95 feet (29.0 m). The vertical clearance is 8.3 feet (2.5 m) at mean low water when closed.

After passing through the draw follow in midstream for ¼ mile and then favor the east bank until due west of a small wharf on the east shore. Haul sharply to southward and head for Buffalo Bluff Light No. 82, leaving the broad opening to the eastward. The deepest water is found 25 yards west of this beacon.

Follow the western shore at a distance of about 100 yards for about ¼ mile and then favor the eastern shore for another ¼ mile, keeping 100 yards off the bank.

The river bends to the southwest here and a broad flat shoal extends across the entire width of the stream. The deepest water, 9 feet (2.7 m) at mean low water, will be found exactly in the middle of the stream, with depths of 8 feet (2.4 m), at mean low water, close by on each side.

When the north end of the north one of the two islands on the west side of the river comes into view, cross toward the south end of this island and follow close to a row of piling. Continue on past **Stokes Island**, keeping about 100 yards to the east of it and head to pass about 50 yards west of Rose Creek Light No. 61.

When abeam, haul slowly out toward midstream and continue until opposite the south end of **Trout Island**. Head for a group of piles on the east shore in the bight. A shoal, which should be avoided, makes out from the east bank.

When about ¼ mile south of **Trout Creek**, haul to the west bank and favor it at a distance of about 100 yards, passing the same distance off the ruined wharf and trestle at **Horse Landing** and the same distance to westward of Horse Landing Light No. 63.

From a position about 300 yards northwest of the mouth of **Camp Branch**, haul to the eastward and favor the north bank around the next bend.

Continue in midstream past a wharf with a clock tower on it on the east bank. Hold in midchannel until off the ruined docks at **Nashua**.

There is a clubhouse and a good wharf at **Satsuma**.

A large shoal, with a reported least depth of 4 feet (1.2 m), has built out from the east bank south of Nashua. There was a stake on this shoal in February 1935.

Keep within 100 yards of the west bank for ½ mile until within 200 yards of Nashua Light No. 84, and then cross to the east side of the river, passing 100 yards north of the light.

Keep within 75 yards of the east bank until the north one of the two **Buzzard Islands** is abeam to starboard. Do not attempt to go through the passage to the northward of these islands.

Beyond Buzzard Island follow the south shore at a distance of about 100 yards and round the sharp point westward of **Welaka Spring** well to the west side of the river, and then haul eastward to pass about 100 yards south of the point. Snags and broken stakes were visible (February 1935) on the midriver shoal on the south side of the channel southwestward of this point. Keep about 100 yards off the east bank until about ¼ mile beyond **Welaka**.

Walaka Light No. 84A stands on the south end of the 5-foot (1.5 m) shoal in midriver opposite the southern end of the village.

Keep about 100 yards off the docks at **Welaka** and pass about midway between Walaka Light No. 84A and the east bank.

With the dock of the fish hatchery at **Welaka** astern, steer for Ocklawaha Light No. 86.

If bound up the Oklawaha River, when about 150 yards from Oklawaha Light No. 86, haul toward the north shore of the river and follow that shore first at a distance of about 30 yards and then at a distance of about 20 yards into the mouth of the **Oklawaha River.** The mouth is often obstructed by hyacinths and is narrow. Do not confuse the entrance of Bear Creek to the southward with the mouth of the Oklawaha. Leave the north shore and head for the south point at the entrance, coming within about 20 yards of it. Then follow the curve of the river about in midstream. A creek enters about 2 miles above the mouth. Pass it on the left side and follow the main stream. **Dean Creek** enters the river from the left side about 12 miles from the mouth. It is blocked by hyacinths about ¼ mile inside its mouth. **Deep Creek** enters about 16 miles from the mouth of the Oklawaha. It is blocked by hyacinths about 1½ miles inside its mouth.

To continue southward in the St. Johns River:

Pass about 50 yards southeastward of Oklawaha Light No. 86 and round slowly to the southeastward, passing about 200 yards southwestward of **Beechers Point,** and steer for Beecher Point Shoal Light No. 88, at the north end of Little Lake George.

Pass about 50 yards eastward of Beecher Point Shoal Light No. 88 and head for Little Lake George Range Front Light No. 65. Pass about 50 yards west of Little Lake George Range Front Light No. 65 and close Little Lake George range astern (front light Fl. W., rear light F. W.; both daymarks, white, square, on pile structures) and stand down the dredged cut across **Little Lake George** on course 212° true (SSW. ¾ W. mag.) for 0.9 mile to Norwalk Point Shoal Light No. 67.

Approaching from northward in the daytime, Little Lake George Range Front Light No. 65 is hard to see as it is low and shows against and just inside the point on the opposite shore of the lake. The spoil bank is on the east side of the cut, and care should be exercised not to overrun the range in approaching it from northwestward. Broken stakes show in places along the spoil bank.

Round Norwalk Point Shoal Light No. 67 to westward at a distance of about 50 yards and haul slowly to the south, giving the point on the west side of the entrance a berth of about 175 yards, and then haul eastward to pass about 75 yards south of Middle Ground Light No. 67 A, and about 125 yards north of the end of the ruined dock at **Norwalk.**

Veer to the northward and, with the ruined dock astern, steer to pass about 75 yards northward of Norwalk Light No. 90. This course leads for the tallest palm on the north shore. Then favor the north bank until past the auto ferry about ½ mile west of **Mt. Royal.** There is a good wharf at this settlement.

Passing the ferry slip on the north shore, stand about 225 yards off the north bank and haul to pass about 25 yards north of Mount Royal Light No. 92.

Round Mount Royal Light No. 92 at a distance of about 25 yards and stand southward for about ¼ mile for a lone dead tree on the far point, and then veer southwestward to pass about 100 yards off the docks at **Fort Gates** and westward of Fort Gates Light No. 69. There is a good wharf and hotel at **Fort Gates**.

Continue on course until south of the docks and then steer 180° true (S. ⅛ E. mag.) for 1⅜ miles to a point about 100 yards east of Black Point Light No. 94.

Veer eastward and steer 114½° true (ESE. mag.) for 0.9 mile until abreast of the westerly docks at **Georgetown**, passing about 100 yards north of Georgetown Light No. 94A; then steer 126½° true (SE. ⅞ E. mag.) for 1 mile, heading for the end of **Orange Point**, and passing about 50 yards north of Georgetown Light No. 96.

Haul to southward and steady on course 166½° true (S. by E. ⅜ E. mag.) passing about 100 yards east of Lake George North End Light No. 98 (white slatted day mark and light on a square pile structure) at the north end of **Lake George**. Coming from the southward this beacon and the buildings on **Orange Point** show well out into the lake in the daytime.

Passing about 100 yards east of Lake George North End Light No. 98, stand across Lake George on course 166½° true (S. by E. ⅜ E. mag.) for 10 miles to **Volusia Bar**. In strong northerly or southerly winds the shallow water of this lake becomes very rough. The old lighthouse at Volusia Bar is the first object to be recognized against the dark background of the southern shore.

Enter the dredged channel across **Volusia Bar** on Volusia Bar Range, passing westward of Volusia Guide Piles Light No. 69 A and between two high wooden breakwaters. When about 100 yards from Volusia Bar Range Front Light No. 100 veer southeastward and steer to pass midway between the wharf on the western point and Volusia Point Shoal Light No. 71. Continue on course to pass about 75 yards south of Volusia South Light No. 73. Round slowly to eastward and pass south of a fish house and about 30 yards off the point about ½ mile eastward of the entrance.

Leave two openings to port. The channel entrance here may be slightly confusing. Hold your course and enter the entrance ahead. Leave two smaller openings to starboard. Hyacinths sometimes obstruct these openings.

Continue in midchannel slightly favoring the bends and pass through the cut south of **Tom Fools Island**.

A highway bridge crosses the river at **Astor**. The draw span is hand moved with a horizontal clearance of 90 feet on either side of the central pier and a vertical clearance, when closed, of 9½ feet (2.9 m) at mean low water.

Pass west of **Lungren Island** and, after passing the ruined docks at **Manhattan**, slightly favor the east bank to **Orange Bluff**, passing eastward of the group of islands.

Round Orange Bluff Light No. 104 at a distance of about 50 yards and head for Lake Dexter Beacon No. 106 (not lighted) passing about 100 yards eastward of the ruined docks on the west bank.

The channel through **Lake Dexter** is well marked by lights and beacons. Pass about 30 yards east and north of Lake Dexter Beacon No. 106, Orange Bluff Shoal Light No. 108, Lake Dexter Beacon

No. 110, Lake Dexter Light No. 112, and round Lake Dexter Beacon No. 114. There is a single pile on the south side of the channel midway between Orange Bluff Shoal Light No. 108 and Lake Dexter Beacon No. 110. A ruined beacon and some brush stakes mark the north side of the channel.

From about 30 yards east of Lake Dexter Beacon No. 114 steer to pass about 50 yards northwest of Mud Lake Point Light No. 75. A spoil bank, covered with brush, lies on the west side of the channel.

Stand in for Idlewilde Beacon No. 77 (unlighted) giving the small island to the westward a berth of about 125 yards and entering the river in midchannel.

Round Idlewilde Beacon No. 77 at a distance of about 25 yards, leaving the wide entrance to **Mud Lake** on the starboard hand, and stand in mid-channel up the river for 7½ miles to **St. Francis.** There is a tall lone cypress and clearing on the south bank. Take the left-hand fork and ¾ mile further on go through the cut-off at **Revolving Bend.**

Passing through the cut-off at **Revolving Bend** swing immediately across the opening to the northward to the north bank of the main river to avoid a shoal, reported by river boatmen to be the worst in the upper river. (Nothing less than 17 feet (5.2 m) was found in the channel on Feb. 19, 1935.) Follow the north shore around the bend and then haul into midchannel. In rounding **Hermitage Point** swing well into the bight to southwestward to avoid the shoal making out to westward of the point.

There is a small lumber mill and dock on the west side of the river at **Crows Bluff,** 14 miles above **Astor** and 19 miles above **Lake George.** There is an aerial wire crossing at the point with a clearance of 88 feet (26.8 m) at mean high water. A highway bridge crosses the river immediately above the bend at **Crows Bluff.** The draw is a swing span, hand moved, with a horizontal clearance of 90 feet on either side of the central pier; the vertical clearance is 9 feet (2.7 m) at mean low water.

There is a good wharf ¼ mile southward from the bridge at **Deland Landing** on the east side of the river. Artesian water and gasoline are available.

Continue in midchannel for 1 mile above the bridge and veer left into the broad opening, leaving two smaller openings to starboard. Round the next two bends leaving two openings about ½ mile apart on the starboard hand.

At **Lambs Bluff** follow the eastern bank and, half a mile beyond, leave an opening to starboard. There is a pointer on a tree on the point between the two streams. A quarter of a mile beyond leave another opening to starboard and veer northeastward.

In **Lake Beresford** pass to the west of a private beacon and follow the western shore at a distance of about 40 yards into the narrow channel of the river. Lily pads and hyacinths mark the eastern side of the channel through the lake.

A quarter of a mile beyond go through a cut-off at **Lake Beresford Bend.** Leave the broad opening of the river to southwestward and pass through **Stark Cut-off,** about 0.3 mile below **Starks Landing.** In the vicinity of **Starks Landing,** follow the western bank leaving several

openings and a wharf to port. There is a small yacht storage house in **Blue Spring Run**. About 0.3 mile above **Starks Landing** leave the broader opening of the river to northwestward and veer southwestward through **Snake Creek Cut-off**. Go through the cut-offs at **Dutchmans Bend, Florida Bend, Coxetters Bend,** and **Manuel Bend**. The cuts are all openings on the starboard bow.

After passing through **Wekiva Cut**, across **Manuel Bend**, take the broader channel to the east of the small island which lies between **Wekiva River** and the **St. Johns River**.

At the sharp point half a mile southward of **Fort Florida** follow the right bank when bound up the river. Cross the river and stand through **Butchers Bend Cut-off**.

Round the next bend. There is an overhead wire crossing about half a mile beyond the bend with a clearance of 77 feet (23.4 m) at mean high water. Continue eastward in midchannel.

At the west end of **Lake Monroe**, 3 miles west of Sanford, and 87 miles above **Palatka**, the river is crossed by two bridges. The first one is the Atlantic Coast Line Railroad bridge, hand moved, with a swing span with a horizontal clearance of 90 feet, when opened. The vertical clearance when closed is 9 feet (2.7 m) above mean low water. The highway bridge, which is motor moved, is of the same dimensions. There is a power house near the east bank above the bridges. There is an aerial wire crossing about ⅜ mile beyond the brdges with a clearance of 77 feet (23.4 m) at mean high water.

After passing through the draws, head to pass about 20 yards southward of Lake Monroe Bar Beacon No. 1. Pass about 20 yards southward of Lake Monroe Bar Beacon No. 1 and Lake Monroe Bar Light No. 3. Haul eastward to pass about 20 yards northward of Monroe Cut Light No. 2, and steady on course 99° true (E. ¾ S. mag.) for 1¼ miles, passing about 20 yards north of Monroe Cut Beacons No. 4 and No. 6, and rounding Monroe Cut Light No. 8 at a distance of about 40 yards. Monroe Spoil Bank Beacons No. 1 and No. 2 to the northward mark an opening through the spoil bank to the open waters of the lake.

From Monroe Cut Light No. 8 steer 132° true (S. E. ⅜ E. mag.) for 1¼ miles to Sanford Cut Light No. 5, passing 20 yards eastward of Sanford Cut Beacons No. 10 and No. 12.

A new terminal channel with a depth of 8 feet (2.4 m) has recently been dredged along the face of the docks and the bulkhead westward of Sanford Cut Light No. 5 and then northward to a junction with the channel across Lake Monroe about midway between Sanford Cut Beacons No. 10 and No. 12. This cut is well marked by beacons. A spoil bank bares on the point between the two channels just westward of Sanford Cut Light No. 5. The depth along the face of the docks at Sanford is 8 feet (2.4 m). Yachts use the excellent city dock which is distinguished by the band stand near the outer end.

SANFORD TO LAKE HARNEY

The route from **Lake Monroe** to **Lake Harney** is reputed to be very scenic. The trip should not be attempted without a local pilot. The controlling depth between Lake Monroe and Lake Harney is reported to be 3 feet (0.9 m) at mean low water (1935). Snagging was in

progress in February 1935. The channel was improved in places by dredging, but there has been no maintenance in recent years.

Sanford Spoil Bank Beacons No. 1 and No. 2 mark the opening through the spoil bank into the waters of the lake off **Sanford**. Lake Monroe Upper Bar Light No. 2 and Lake Monroe Upper Bar Beacon No. 4 mark the south side of the cut into the river at the east side of the lake.

Three miles east of Sanford and above Lake Monroe a highway bridge crosses the river. The swing draw span has a horizontal clearance of 65 feet and a vertical clearance of 7½ feet (2.3 m) above mean low water. There is a small boat-repair yard and yacht-storage house in the small gut westward of the bridge. There is a vertical-lift dry dock capable of handling from 50 to 65 tons and a draft of 6 feet (1.8 m). Gasoline and fresh water can be obtained. Yachts lie here to avoid the rough water of the lake at the docks at Sanford. There is a hard-surfaced road to Sanford.

At the entrance to **Lake Jessup**, 6 miles east of Sanford, a highway bridge crosses the channel entering the lake. The draw is a swing span with a horizontal clearance of 48 feet and a vertical clearance of 9 feet (2.7 m) at mean low water. A cut-off channel for the main river just north of the bridge has been dredged to 6 feet (1.8 m).

The Florida East Coast Railway crosses the river about 1 mile northward of **Lake Harney**. The draw is a single-leaf bascule span with a horizontal clearance of 50 feet and a vertical clearance of 8 feet (2.4 m) at mean low water.

There is a lumber mill and post office at **Oceola**.

Lake Harney is reported very shallow with a controlling depth of about 2 feet (0.6 m).

13. ST. JOHNS RIVER TO MIAMI

The **Intracoastal Waterway** parallels the coast from the St. Johns River to Miami, a distance of 383 miles. This waterway, affording a protected inland route for vessels of limited draft, passes through the old Florida East Coast Canal, Mosquito Lagoon, Indian River, Lake Worth, and connecting waterways to Biscayne Bay. A project depth of 8 feet (2.4 m) at mean low water in a channel 100 feet wide is being maintained although the controlling depth may at times be temporarily reduced by shoaling. The details of the route are given in the **Inside Route Pilot, New York to Key West.**

COAST FROM ST. JOHNS RIVER TO CAPE CANAVERAL

(Charts 1243, 1244, 1245)

From St. Johns River to Cape Canaveral the coast trends south-southeastward for 125 miles and is broken by three unimportant inlets. The coast shows an almost continuous range of sand hills backed by woods; the woods in the vicinity of Cape Canaveral and for a distance of 17 miles northward are farther back from the beach and consequently are less distinct when seen from seaward.

The depths along this stretch of coast are irregular. Except off St. Johns River and St. Augustine and Ponce de Leon Inlets, 5 to 7

fathoms (9.1 to 12.8 m) can be taken as close as 1 mile and 3 fathoms (5.5 m) as close as ⅜ mile to the beach until approaching Cape Canaveral. Broken ground, with spots having 5 to 6 fathoms (9.1 to 11.0 m) over them, lies from 4 to 6 miles offshore and from 12 to 16 miles north-northeastward of St. Augustine Lighthouse. There is a channel with a depth of 6½ to 7¼ fathoms (11.9 to 13.2 m) inside the shoal and about 2 miles from the beach. The shoals are about 8 miles long in a southeasterly direction and about 2½ miles wide.

The distance from Ponce de Leon Inlet to Cape Canaveral is 41 miles. The coast trends about southeast by south in nearly a straight line for 32 miles to False Cape; thence to Cape Canaveral, 9 miles, it trends south-southeasterly. It is bold to the vicinity of False Cape, between which and Cape Canaveral there are dangerous outlying shoals. Off Ponce de Leon Inlet 10 fathoms (18.3 m) will be found within 2 miles of the beach. A recent survey shows two shoal spots with depths of 6½ fathoms (11.9 m) about 7 miles north-northeast from Ponce de Leon Inlet. Going southward the 10-fathom (18.3 m) curve gradually works offshore to a distance of 10 miles off False Cape.

For about 25 miles south of Ponce de Leon Inlet the coast is formed by a very narrow strip of lowland lying between the sea and Hillsborough River and Mosquito Lagoon. Seen from seaward, it shows a low line of sand hills partly covered with grass and scrub, with distant woods showing over. The only natural object at all distinctive in appearance is Turtle Mound, a green hillock about 10 miles south of the inlet. This, when seen from the northward and eastward, is quite conspicuous but from other points of view is less marked. This stretch of coast line has been settled rapidly in recent years. In places there are structures visible from seaward that will be of material assistance in fixing the position of vessels southbound, when sailing close in, to avoid the Gulf Stream. The more important places are described below.

St. Augustine Inlet.—This inlet is the entrance to St. Augustine Harbor and the approach from sea to the city of St. Augustine. The inlet is about 30 miles southward of the entrance to St. Johns River and is marked on its southern side by St. Augustine Lighthouse and two radio masts.

The entrance to the inlet is obstructed by a shifting shoal which extends 1½ miles seaward and forms a dangerous bar over which the channel depth was reported to be 5½ feet (1.7 m) in November 1935.

The channel is marked by small buoys and by *St. Augustine Lighted Whistle Buoy 2 St. A.*, which are shifted to the best water. Strangers should not enter without a pilot. There are no licensed bar pilots at St. Augustine, but if the harbor master is informed of the need and the expected time of arrival, an endeavor will be made to have a pilot waiting outside the bar. The usual charge for pilotage is **$1.50 per foot.** The bar and channel are said to shift frequently.

In 1935 the channel ran in southward toward the northeast point of Bird Island and then swung to the westward and passed close to the north end of the island. Although there is good anchorage inside of the inlet, it is not used as a harbor of refuge, because in

strong northeasterly and northwesterly winds the sea makes the bar impassable even for small vessels.

Tolomato or North River enters the inlet from the northward just inside the point of the North Beach. It rises about 15 miles northward of the inlet, has an average width of ¼ mile, and depth of 15 feet (4.5 m) for several miles from its mouth. It is important in being a part of the **Intracoastal Waterway**. There is a highway bridge about ½ mile north of the junction of the Tolomato River and St. Augustine Inlet.

Matanzas River enters the inlet from the southward. It is about 15 miles long to Matanzas Inlet and separates Anastasia Island from the mainland. Above St. Augustine the river has a channel depth of 10 feet (3.0 m) for a distance of 8 or 10 miles. The channel is well marked and, through the broader section of the river, is very narrow and winds between shoals which are visible at low water. The most difficult part of the river is in the narrow channel northwest of **Crescent Beach**, where the least depth is 8 feet (2.4 m) at low water. The **Intracoastal Waterway** follows the channel of Matanzas River.

San Sebastian River flows past the west side of the city of St. Augustine and empties into Matanzas River 1½ miles south of the bridge. The channel from the Matanzas River to the wharves is marked by beacons. It is said to have a depth of 5 to 7 feet (1.5 to 2.1 m) at the entrance, and 8 feet (2.4 m) inside as far as the highway bridge. Supplies and gasoline may be taken at a wharf on this river on the west side of the city. Important wharves connected with the fishing trade are located on this river. In stormy southeasterly weather, smaller boats may find a good haven in this river.

St. Augustine is a popular winter resort for tourists and yachtsmen and has several fine hotels open during the winter season. A railroad connects with Jacksonville and points south. The channels to St. Augustine through the **Intracoastal Waterway** are well marked by buoys and beacons and present no difficulties for a draft of 8 feet (2.4 m).

There is good anchorage abreast of the city in the Matanzas River, both above and below the bridge, through which there is a wide draw. There are a number of small private landings on the east side of the city, north and south of the bridge. The municipal pier is about 100 yards south of the Matanzas River bridge. It affords good berths for yachts and free fresh water is obtainable. This pier, on which the local harbor master has his office, has depths of 10 to 20 feet (3.0 to 6.1 m) in the various slips, and from 10 to 18 feet (3.0 to 5.5 m) at its face. A charge is made for wharfage after the first 12 hours of one dollar per day for boats 50 feet in length, and up to two cents per foot for boats over 50 feet in length. Approach to the pier is from mid-channel on a course about parallel with the bridge.

Supplies.—Provisions, water, gasoline, and some coal can be had here.

Repairs.—There are facilities for making minor repairs to hulls and machinery and ways for hauling out craft up to 60 feet in length. The nearest place for general repairs is Jacksonville.

Storm warnings are displayed from a tower at Fort Marion, on the water front.

Tides.—The average rise and fall of tides is about 4½ feet (1.4 m), and high water occurs about one-half hour later than at Mayport.

Prominent features.—**St. Augustine Lighthouse**, lat. 29°53′07″ N., long. 81°17′19″ W., on the south side of St. Augustine Inlet, is a black and white, spirally banded, conical tower. The light is fixed white varied by a white flash of 0.3 seconds' duration every 30 seconds, 161 feet (49.1 m) above high water and visible 19 miles.

Radio towers about 200 yards north of the lighthouse are prominent. The tops of the radio towers are marked by fixed red lights.

A black water tank in St. Augustine and one near the beach about 1¼ miles north of the inlet show up well to seaward.

Directions.—When approaching St. Augustine Inlet, the shore should be given a berth of at least 2 miles, so as to keep outside the sea buoy.

No stranger should attempt to enter without a pilot, as the channel shifts frequently, and no information as to buoys or courses would be reliable for any length of time. The master of a vessel bound for St. Augustine should telegraph to the harbor master the probable date of her arrival off the bar, so that a pilot can be on the look-out for her.

Matanzas Inlet is 11 miles southward of St. Augustine Lighthouse. It affords an outlet for Matanzas River, which extends northward to St. Augustine and southward, following the coast for a distance of 8 or 10 miles to Graham Swamp, in which it takes its rise. The inlet is obstructed by a shifting bar and is now virtually impassable; sometimes being entirely dry. A highway bridge has been built across this inlet, with a draw span 40 feet wide.

A canal runs southward from Matanzas Inlet for 21½ miles to Halifax River and parallels in general the coast line. It is part of the **Intracoastal Waterway** and is fully described in the **Inside Route Pilot, New York to Key West**, previously referred to.

Matanzas Aviation Beacon is located about three-fourths mile northward of Matanzas Inlet. The light is flashing white, 64 feet (19.5 m) above high water.

A 4-masted schooner lies stranded on the beach about 3 miles southward of Flagler Beach and near Bulow Coast Guard Station. It is reported that the wreck constitutes a good landmark.

Flagler Beach Aviation Beacon is located at the northern end of Flagler Beach. The light is flashing white, 64 feet (19.5 m) above high water.

Daytona Beach is a popular winter resort, population 16,598 in 1930, on both banks of the Halifax River and extending eastward to the ocean beach, about 9½ miles north-northwestward of Ponce de Leon Lighthouse. It is on the Florida East Coast Railway and is connected by water freight service northward through the **Intracoastal Waterway** with Jacksonville. The buildings on the beach are visible from seaward. A large recreation pier on the ocean front is a prominent landmark for passing vessels.

Ponce de Leon Inlet is about 53 miles southward of St. Augustine Lighthouse and 41 miles northwestward of Cape Canaveral Light-

house. The entrance, which is about one-half mile wide, is obstructed by shifting shoals which extend about three-fourths mile seaward and form a bar, over which there is a channel depth of about 7 feet (2.1 m). *Sea Buoy PL* marks the entrance to the inlet. The inlet is easy to enter on a smooth sea, but in case of necessity the lighthouse keeper will pilot in or out. This inlet is used by small craft bound for New Smyrna or Daytona Beach and an occasional stranger entering for an anchorage. The inlet is now being improved by the dredging of a channel across the bar. The controlling depth in the channel will be 8 feet (2.4 m). The average rise and fall of tide is about 2½ feet (0.8 m); high water occurs about the same time as at Mayport.

Ponce de Leon Lighthouse, lat. 29°04′50″ N., long. 80°55′42″ W., is on the coast, about 1 mile north and west of the entrance to the inlet. It is a red brick, conical tower showing a group-flashing white light every 30 seconds (6 flashes 0.5 seconds, 5 eclipses 2 seconds each, 1 eclipse 17 seconds), 159 feet (48 m) above high water, visible 19 miles.

Halifax River extends north from the inlet about 25 miles, running parallel to the beach, from which it is separated by a low strip of land only ¼ to ½ mile in width. **Ponce Park**, near the inlet, **Port Orange**, **Daytona Beach**, and **Ormond**, stations on the Florida East Coast Railway, are the principal landings on the river. For detailed information of vicinity of Daytona Beach and New Smyrna, see **Inside Route Pilot, New York to Key West.**

Hillsborough River extends southward from the inlet for a distance of 15½ miles through the marshes to Mosquito Lagoon. The river in some places is narrow and crooked and requires careful steering and close attention to the channel beacons. A drawbridge crosses the river 1¾ miles above the inlet, and another crosses it at New Smyrna, about 3 miles from the inlet. The **Intracoastal Waterway** passes southward through Hillsborough River.

New Smyrna is a winter resort on the western bank of Hillsborough River 3 miles from Ponce de Leon Inlet. It is on the Florida East Coast Railroad. There are some fish wharves at the bend in the river north of the bridge. The municipal wharf which has a depth of from 9 to 11 feet (2.7 to 3.4 m) at its face is the first one north of the bridge; north of this is an oil wharf with a depth of 9 feet (2.7 m) at its face. No charge is made for berths alongside the city wharf, which is piped for fresh water. There is a basin for shallow draft boats. There are some small private piers south of the bridge. Provisions, gasoline, and some yacht supplies can be had here. There is a marine railway, in the bend of the river north of the bridge, that is capable of hauling out boats of a draft of 6 feet (1.8 m) and of a length of about 60 feet. There are strong tidal currents in the river abreast the city. The draft that can be carried to the town is limited only by the depth on Ponce de Leon Inlet bar.

False Cape is the name given to a small part of the coast about 9 miles northward of Cape Canaveral, which it resembles when seen from seaward.

Cape Canaveral, where the coast makes a sharp bend westward, is low and sandy and is marked by Cape Canaveral Lighthouse.

Cape Canaveral Lighthouse, lat. 28°27′37″ N., long. 80°32′37″ W., is a white and black, horizontally banded, conical iron tower. The light is flashing white every 15 seconds (flash 1.3 seconds, eclipse 13.7 seconds). 137 feet (41.8 m) above the water, and visible 18 miles. There is a **Radiobeacon** at the lighthouse (for description see Light List, Atlantic Coast, or H. O. Pub. No. 205). Vessels may communicate with the lighthouse by the International Signal Code.

The wreck 16½ miles 140° from Cape Canaveral Lighthouse no longer shows and the Coast Guard reports a least depth of 11 fathoms over the wreck.

The wreck of the *Mohican* lies about 3⅞ miles 173° true from Cape Canaveral Lighthouse. A buoy marks the wreck.

Broken ground and shoals extend 13 miles northward and northeastward from Cape Canaveral, terminating in **Hetzel** and **Ohio Shoals**, which have a depth of 12 and 19 feet (3.7 and 5.8 m), respectively. A recent survey has disclosed the existence of several shoal spots to the northeastward of Cape Canaveral. The area inside of Hetzel and Ohio Shoals should be navigated with extreme caution.

Hetzel Shoal Lighted Whistle Buoy 8 (flashing white light) is moored in lat. 28°39′ N., long. 80°22′ W., in 66 feet (20.1 m), east-northeast of the north end of Hetzel Shoal, with Cape Canaveral Light bearing 221° true (SW. ½ S. mag.), distant 14.7 miles. A nun buoy is moored alongside. A depth of 3 fathoms (5.5 m) has been reported 2.3 miles west-northwest from the buoy, and a 14-foot (4.2 m) sounding has been reported 5.8 miles west-northwest from the buoy.

Southeast Outer Shoal Buoy 2 (red, 1st-class nun) is moored in 24 feet (7.3 m) of water, with Cape Canaveral Light bearing 302½° true (NW. by W. ⅛ W. mag.), distant 7.5 miles.

The least depths found on the inner shoals range from 7 to 16 feet (2.1 to 4.8 m), with shoaler water inside; the shoals are subject to some change in position and depth, and only small light-draft craft can safely pass inside the outer shoals. In a heavy sea the shoals are marked by breakers, but with a smooth sea there is nothing to indicate them except Cape Canaveral Lighthouse and the buoys marking Hetzel, Ohio, and South East Outer Shoals.

The effect of the Gulf Stream may be expected well in on the shoals, and this should be kept in mind in approaching the shoals from southward, as a vessel will generally overrun her log. Approaching from southward, 15 fathoms (27.4 m) is a good depth by which to avoid the shoals; from northward, 13 fathoms (23.7 m). Vessels are advised to use great care when navigating in the vicinity of the shoals off Cape Canaveral.

CAPE CANAVERAL TO FORT PIERCE INLET

(Charts 1246 and 1247)

From Cape Canaveral to Fort Pierce Inlet the coast trends generally south-southeastward for 61½ miles and is broken by Sebastian Inlet. This section of the coast is formed almost entirely by a low, narrow strip of sand, covered with vegetation, which lies at a distance of 1 to 2 miles from the mainland, from which it is separated by the shallow waters of **Banana** and **Indian Rivers**, a part of the Intra-

coastal Waterway. From seaward the coast shows a line of sand hills partly covered with grass and scrub palmetto. At several places real estate developments have sprung up and the buildings show prominently from seaward. Access to the mainland from these developments is secured by bridges across the Banana and Indian Rivers. Behind all is the background of heavy woods on the mainland.

The coast between Cape Canaveral and Fort Pierce Inlet has broken ground in places, which extends off a greatest distance of about 10 miles at **Bethel Shoal**, least depth 28 feet (8.5 m).

Bethel Shoal Lighted Whistle Buoy 10 (flashing white light) is moored in lat. 27°44′ N., long. 80°10′ E., in 48 feet (14.6 m) off the east side of Bethel Shoal, and about 11 miles from shore. From it Bethel Creek Coast Guard Station (house of refuge) lies 247° true (WSW. mag.), distant 11 miles. A nun buoy is moored close by. It lies 47 miles southward of Cape Canaveral and the same distance northward of Jupiter Inlet Lighthouse.

Indian River Shoal lies about 8 miles north of Fort Pierce Inlet. A recent survey shows a depth of 12 feet (3.7 m) 3⅛ miles 357° true from Indian River Inlet Coast Guard Station. There is a depth of 4 fathoms (7.3 m) about 2¾ miles 36½° true from the above Coast Guard station.

The Bight, southwest of Cape Canaveral, is frequently used by moderate-draft vessels seeking shelter in heavy northerly weather. It furnishes excellent shelter for all winds from southwest, around through northwest to north-northeast. If the wind hauls more to eastward the swell is somewhat broken by the shoals, but the anchorage is likely to be uncomfortable. No directions are necessary, other than to use an up-to-date chart.

The wreck of the *Mohican* lies 3⅞ miles 173° true from Cape Canaveral Light. One mast of the wrecked vessel has fallen, the other is likely to fall at any time. A buoy marks the wreck.

There is a wharf about 2 miles southwest from the lighthouse, and a bathing and dancing pavilion located nearby. There is good highway connection from this region to the town of Cocoa, on the mainland.

Sebastian Inlet.—An artificial channel has been dredged through the outside beach, leading into the Indian River in latitude 27°51′30″ N. It is 37 miles south of Cape Canaveral Lighthouse and is abreast the mouth of Sebastian Creek, which empties into the Indian River from the west side. At the entrance two jetties have been built, the north one extending eastward 400 feet from shore; the south jetty extends 300 feet from shore. A steel bulkhead has been constructed leading in a west-northwest direction for a distance of about 1,500 yards from the south side of the inlet into the Indian River. According to surveys of the United States Engineers made in 1934 the controlling depth in the inlet was 5½ feet (1.7 m) but a draft of only 2½ feet (0.8 m) could be carried to the channel of the Intracoastal Waterway in the Indian River.

This inlet should not be used by strangers, on account of strong tidal currents. It is only used by small local fishing boats, most of which make their headquarters at the town of **Sebastian.**

Indian River Inlet is reported to be entirely closed.

FORT PIERCE INLET AND PORT OF FORT PIERCE

Fort Pierce Inlet is located 33½ miles northward of Jupiter Inlet Lighthouse and 61 miles southward of Cape Canaveral Lighthouse. The entrance is improved by two parallel jetties extending out into the Atlantic Ocean about 1,800 feet from the shore line. In 1935 the controlling depth at the entrance was 23 feet (7.0 m), with a depth of 21 feet (6.4 m) in the channel between the inlet and the town and in the turning basin adjacent to the terminal slips at the Port of Fort Pierce.

Fort Pierce Inlet Lighted Whistle Buoy 2 (flashing red) is located in 30 feet (9.1 m) on the outer range, 1 mile off the end of the jetties.

Just southward of the town of Fort Pierce is a lighted aerial beacon (lat. 27°24′38″ N., long. 80°19′33″ W.), showing a revolving white light, visible well to seaward. The city also maintained a fixed red light on the top of a water tank which is located ½ mile southwestward of the town. This light is also visible well to seaward and is a good navigational mark in clear weather.

A large two-storied, rose-colored casino on the beach marks the inner end of the south jetty.

The entrance is rough in southeasterly weather with an ebb tide.

Tides.—The mean range of tide at the jetties is about 2½ feet (0.8 m) and at the city dock about ¾ foot (0.2 m).

Currents.—The tidal currents in the inlet have a velocity at strength of about 3 knots.

It has been reported that a strong current, about 5 knots, runs through the cut parallel with the channel, but at the turn in the channel extreme caution should be used, as the current sets across the channel, flood tide to the south and ebb tide to the north. Across Indian River the currents run parallel with the channel, which parallels the causeway fill. At the western end of this fill cross currents are sometimes encountered, especially where the channel crosses the **Intracoastal Waterway.** The northwestern corner of this intersection is marked by a red nun buoy. Currents in this section are mostly controlled by the winds.

Directions.—The dredged channel is marked by range lights and buoys, is narrow, and the currents are strong. Care must be exercised in entering. The water outside the channel is shallow. The entrance channel into the shore line is 240 feet wide. At about the shore line and through the cut the channel is 180 feet wide. The point where the channel narrows to 180 feet is marked on the northern side by a red nun buoy. After passing through the entrance the channel narrows to 100 feet and makes a turn to the left of 17° and leads across Indian River to the Fort Pierce Turning Basin and terminals.

With *Fort Pierce Inlet Lighted Whistle Buoy 2* close aboard close Fort Pierce Inlet Entrance range ahead (front light Fl. R., rear light Occ. R.; both daymarks, white with a black vertical stripe, on skeleton structures) and steer 259° true (WSW. ⅞ W. mag.) for 1.. miles to a position northward of *Fort Pierce Entrance Buoy 3* (black can) marking the turn in the channel. Close Fort Pierce Inner range astern (front light Fl. W., rear light Occ. W.; both daymarks, white, square with black round center, on skeleton towers) and steer 242° true (SW. by W. ⅜ W. mag.) to the turning basin off the docks.

The inner end of this range line is marked by Fort Pierce Inlet Center Light (F. R.) on the top of the warehouse on range with two fixed red lights, one above the other, on a pole, and maintained by the Fort Pierce Harbor Commission.

The end of the inner channel at the turning basin is marked by two lights, one on either side of the channel. The turning basin is 900 feet long (north and south) and 775 feet wide (east and west). The municipal piers are at the western edge of the turning basin. Under certain weather conditions there is a fairly strong current which sets across the ends of the piers, but this depends mostly on wind conditions.

Fort Pierce, population 4,803 in 1930, the county seat of St. Lucie County, is on the west shore of the Indian River opposite Fort Pierce Inlet. There are good hotel accommodations and railroad, highway, telephone, and telegraph connections. The city ships citrus fruits, vegetables, and lumber. It is a distributing point for supplies to the surrounding country. The **Intracoastal Waterway** passes through the Indian River east of the city.

Quarantine.—Vessels are boarded by the quarantine officer at the docks.

Pilots are available and will meet vessels off the bar on previous notice.

Pilotage.—The pilot rates for Fort Pierce Inlet are as follows:

	Per foot
Up to 10 feet	$1.50
10 to 13 feet	2.00
13 to 17 feet	2.50
17 to 20 feet	3.00

Terminal facilities.—A terminal for sea-going vessels has been constructed at Fort Pierce. It consists of a turning basin and slips, which provide a berthing space of about 1,500 feet. There are depths of 22 feet (6.7 m) in the slip on the north side of the municipal pier and at the pier of the Indian River Refrigeration Terminal Co. The turning basin has a depth of 22 feet (6.7 m). The two piers are both about 320 feet in length. The southern or municipal pier is open on the north and east sides only. Small vessels may dock on the east side and larger vessels on the north side. The northern pier is open on both north and south side. Vessels also dock across the end of this pier, which is 178 feet in width. When so moored the north and south sides of this pier are blocked to entering vessels.

There is a wharf immediately south of the bridge across the Indian River to which a depth of about 4 feet (1.2 m) can be carried. Approach from the channel of the **Intracoastal Waterway** must be made from a point about 500 yards south of the bridge as spoil banks, with a controlling depth of about 2 feet (0.6 m) over them, parallel the channel immediately eastward of this dock.

Supplies.—Gasoline, Diesel oil, oil, fresh water, provisions, and supplies are available. The fuel oil is controlled by the municipal authorities and amounts to 10,000 barrels. Oil is received and delivered by an 8-inch line and no adapters are available at present. There is gasoline-boat service to boats at the docks.

Repairs.—There is a marine railway and machine shop about ⅛ mile northward of the terminals. Vessels of 7½-foot (2.3 m) draft,

75 feet in length, and about 150 tons can be hauled out. Local knowledge is necessary to carry the best water to the railway.

A small marine railway is located in **Moores Creek** about ¼ mile south of the bridge. This creek affords a haven for small boats. A draft of about 3½ feet (1.1 m) can be carried into the creek. To approach the entrance come well to the south of it and then come west with the smokestacks of the power plant in range ahead.

Communications.—Fort Pierce is served by the Florida East Coast Railway.

There are regular freight-boat connections to Baltimore, Philadelphia, and New York.

Aviation fields.—**Fort Pierce Airport** is located 2½ miles south of the city. The airport is county-owned. There are three landing strips, 2,170 by 335 feet, 2,600 by 600 feet, and 1,800 by 400 feet, respectively. There are day facilities for serving aircraft.

Storm warnings are displayed in Fort Pierce in daytime only.

United States Public Health Service.—There is a relief station of the United State Public Health Service at Fort Pierce.

FORT PIERCE INLET TO LAKE WORTH INLET

From Fort Pierce Inlet to Lake Worth Inlet the coast trends generally south-southeastward for 42½ miles and is broken by St. Lucie and Jupiter Inlets. This section of the coast is formed by a low, narrow strip of sand, covered with vegetation, and separated from the mainland by the shallow waters of the Indian River and by the **Intracoastal Waterway** connection between the Indian River and Lake Worth. From seaward the coast shows a line of sand hills partly covered with grass and scrub palmetto. Behind all is the background of heavy woods on the mainland. The buildings of the various real-estate developments along this section of the coast show prominently from seaward. Access to these developments is secured by bridges across the Indian River and the Intracoastal Waterway.

For a distance of 13 miles southward of Fort Pierce Inlet broken ground with 3 to 4 fathoms (5.5 to 7.3 m) over it extends from 2½ to 6 miles offshore.

Capron Shoal has a depth of 18 feet (5.5 m) about 3½ miles southeastward of Fort Pierce Inlet. *Capron Shoal Buoy 10A* is placed in 24 feet (7.3 m) 300 yards northeastward of the 18-foot spot.

St. Lucie Shoal, with 16 to 24 feet (4.8 to 7.3 m) over it, is the principal danger. It lies from 3 to 6 miles offshore, and 22 to 26 miles northward of Jupiter Inlet Lighthouse. The northern end of the shoal is marked by *St. Lucie Shoal Lighted Whistle Buoy 12* placed in 51 feet (15.5 m) of water. There is a red nun station buoy 100° true, 200 yards from the lighted buoy. *St. Lucie Shoal Buoy 14*, a red nun buoy, has been placed in 24 feet (7.3 m), 200 yards eastward of the 16-foot spot near the southern end of the shoal.

In addition to the shoal spot marked by the lighted whistle buoy, another with 18 feet (5.5 m) over it has been reported 3¾ miles, 11° true, from the buoy. In 1926 a vessel reported grounding on a 24-foot (7.3 m) sand patch, about 7¼ miles, 11° true, from the buoy. Of these last two reports neither has been verified.

A shoal, on which the least depth found is 5¾ fathoms (10.4 m), lies 3 miles from shore off St. Lucie Inlet, 13 miles northward of Jupiter Inlet Lighthouse. A depth of 6½ fathoms (11.9 m) has been found on the shoal, which extends 3 miles from shore about 3 miles northward of Jupiter Inlet Lighthouse.

These shoals should be avoided by deep-draft vessels; the 15-fathom (27.4 m) curve is a safe guide.

St. Lucie Inlet.—This inlet forms the mouth of St. Lucie River and the south end of Indian River. It lies 13½ miles north of Jupiter Lighthouse and 20 miles south of Fort Pierce Inlet. A construction project now under way aims to deepen this inlet sufficiently for the use of moderate-draft coastwise vessels. When completed, this project provides for wharves along the north shore of the entrance to Manatee Creek. In June 1928 a portion of the north jetty had been built offshore for a distance of 3,325 feet.

The proposed improvements have not been completed, and the limiting depth in the entrance remains about 5 feet (1.5 m). **An aviation beacon** established near Stuart, west of St. Lucie Inlet, shows a revolving white flash seaward. This should not be confused with Jupiter Light by vessels approaching from the north and east.

The mean range of tide at the jetties is about 2½ feet (0.8 m).

St. Lucie River enters the sea through St. Lucie Inlet and connects with the St. Lucie Drainage Canal, and thence through Lake Okeechobee with a series of waterways extending to the Gulf coast. The route through to the Gulf is now open with a controlling depth of about 3½ feet (1.1 m) in Lake Okeechobee.

There are no restrictions as to the passage of small craft, but large plants desiring to enter the lake must notify the district engineer at Jacksonville in order that the bypass at the lock at Lake Okeechobee may be made available.

There is an overhead cable crossing at the bridges at Stuart, vertical clearance 94 feet (28.7 m) at mean low water. The Florida East Coast Railway bridge at Stuart is a single-leaf bascule draw, horizontal clearance 50 feet, vertical clearance when closed 9 feet (2.7 m) at mean low water. The highway bridge immediately above the railway bridge has a horizontal clearance of 80 feet and a vertical clearance of 15 feet (4.6 m) at mean low water when closed. The draw is a double-leaf bascule.

The St. Lucie River also has several branches of some commercial importance. These branches, with the main river, form an important center for yachting and fishing in the winter months.

South Branch St. Lucie River is crossed by a double-leaf bascule draw highway bridge at Palm City, 8.5 miles above the mouth of the river. The bridge has a horizontal clearance of 59 feet and a vertical clearance when closed of 13.2 feet (4.0 m). The route to Lake Okeechobee passes up the South Branch.

St. Lucie Canal is now a much-traveled thoroughfare, being a part of the cross-Florida waterway. The locks have recently been lengthened to 250 feet and the sills lowered to give a depth of 7 feet (2.1 m) over them. Five bridges cross the canal. The controlling vertical clearance for the cross-Florida route is at the Florida East Coast Railway vertical lift bridge at Mayaca. There is a clearance of 63.4 feet (19.3 m) at mean low water when the bridge is open.

Stuart is located on the St. Lucie River, about 6 miles from the inlet. It is on the Florida East Coast Railroad and is of some commercial importance. Gasoline, water, provisions, and yacht supplies can be obtained here, and there are facilities for hauling out boats up to about 5-foot (1.5 m) draft and 80 feet in length on the north side of the river east of the bridges.

A draft of 4 feet (1.2 m) can be taken to the city dock on the south side of the river about ⅛ mile east of the bridges, 10 feet (3.0 m) to the Stuart Marine Service dock on the north side of the river east of the bridges, and about 6 feet (1.8 m) to the municipal dock on the east side of the river about 500 yards above the bridges.

The channel from the **Intracoastal Waterway** in Indian River is well marked and easy to follow. A long shoal which makes out in a northerly direction from the point of land at the north end of the town is marked at its extremity by a single pile beacon.

A **pilot** can be obtained for the inlet and river by communicating with the Stuart Yacht Club.

Manatee Creek enters St. Lucie Inlet from the southwest. The town of **Salerno** is located at the head of the creek. It is headquarters for a fishing fleet. There are 5 feet (1.5 m) of water alongside the municipal wharf. In September 1934 the harbor was dredged to a depth of 5 feet (1.5 m), which is the controlling depth from the inlet. There is good anchorage for small boats anywhere in the creek, and little current is noted inside the creek entrance. Gasoline can be obtained at the fish docks. There is a marine railway capable of hauling out vessels of 15 tons and 65 feet in length.

The **Intracoastal Waterway** in the vicinity of St. Lucie Inlet is well marked by lights and buoys. The passage from the Indian River and thence to the southward via Great Pocket is described in the **Inside Route Pilot, New York to Key West.**

Jupiter Inlet Lighthouse, lat. 26°56′54″ N., long. 80°04′56″ W., is located on the north shore of Jupiter Inlet, about 95 miles south of Cape Canaveral Lighthouse. The light is group-flashing white every 30 seconds (flash 1.2 seconds, eclipse 6.6 seconds, flash 1.2 seconds, eclipse 21 seconds) on a red-brick tower, 146 feet (44.5 m) above the water and visible 18 miles.

A radiobeacon is operated at the lighthouse. The poles for the naval radio direction finder station are located close to the lighthouse. The tops of the radio towers are marked by fixed red lights. The aviation beacon near Stuart should not be confused with Jupiter Inlet Lighthouse. Storm warnings are displayed.

Jupiter Inlet is an unimportant opening through the beach just south of Jupiter Inlet Lighthouse. It forms the connection with Jupiter Sound from northward, Jupiter River from westward, and Lake Worth Creek from southward. A short stone jetty has been built to seaward on each side of the entrance. The inlet is blocked by a shifting bar and is not marked. It is reported that a draft of 2 feet (0.6 m) can be carried through the inlet at mean low water with a smooth sea. The small boats of the local fishing fleet are the only ones using this inlet. It is never used by strangers. It is reported that, whenever the bar is passable, a pilot from the lighthouse will come out on signal from a boat desiring to enter. There is a

dock on the south side of and just inside the inlet where gasoline and fresh water can be obtained.

The town of **Jupiter** is on the south bank of Jupiter River, about a mile from the inlet. Three bridges cross the river near the town, each of which has a draw span. Gasoline and supplies in limited quantity may be obtained here. See the **Inside Route Pilot, New York to Key West,** for details of the **Intracoastal Waterway.**

Jupiter Inlet Lighthouse from southeastward.

LAKE WORTH INLET AND PORT OF PALM BEACH

(Chart 1248)

Lake Worth Inlet is an opening cut through the beach about 11 miles south of Jupiter Inlet Lighthouse and 31 miles north of Hillsboro Inlet Lighthouse. This cut has been improved by dredging and the construction of jetties and affords connection from the sea through a dredged channel to the Port of Palm Beach.

In June 1935 there was a channel depth of 20 feet (6.1 m) from the sea to the docks and in the turning basin at the Port of Palm Beach. The channel is well marked by lights and ranges.

Lake Worth Inlet Lighted Whistle Buoy 2 LW (flashing red) is located in 36 feet (11.0 m), 0.6 mile off the entrance to the inlet.

Currents.—The currents in the inlet are strong and must be carefully guarded against, the velocity at strength of flood and ebb being about 2½ knots and 3½ knots, respectively. On the ebb tide there is a heavy tide rip between the jetties, part of which may be avoided by holding close to the outer end of the north jetty. On the flood tide the current sets against the north jetty and care must be taken to avoid it.

Tides.—The mean range of the tide at the Port of Palm Beach is about 2 feet (0.6 m).

Prominent objects.—In approaching Lake Worth Inlet, a large, uncompleted hotel building, located about ¾ mile north of the entrance, is a very prominent landmark. The wireless poles on the

ocean pier at Palm Beach, 3½ miles south of the entrance, show up well, and the hotels and buildings at Palm Beach are prominent from seaward. There is a fixed red light on one of the tallest buildings at Palm Beach. The light appears to flash occasionally due to intervening buildings when off Jupiter Inlet. Do not confuse this light with *Lake Worth Inlet Lighted Whistle Buoy*.

Directions for entering.—From a position about 100 yards south of *Lake Worth Inlet Lighted Whistle Buoy 2 LW*. close Lake Worth Entrance range ahead (front light Fl. W., rear light Occ. W.; both daymarks, white square with red round center on skeleton structure) and steer 270° true (W. ⅛ S. mag.) for ½ mile to a position about 125 yards northeast of Lake Worth Inlet Light No. 1 (Fl. W.) Thence change course to close Lake Worth Inner range ahead (both lights F. R.; both daymarks white pole) and steer 253° true (WSW. ⅜ W. mag.) to the turning basin off the docks, passing north of Lake Worth Inlet Lights No. 1 and No. 3.

Port of Palm Beach is a marine-terminal development on the west side of Lake Worth, abreast Lake Worth Inlet. The wharves are

Lake Worth Inlet looking westward, jetties in foreground.

in the town of Riviera, about 3 miles north of West Palm Beach, and have good rail, bus line, and highway connection. They are known locally as the Riviera Docks. The Port of Palm Beach is a port of entry.

A turning basin 700 feet by 800 feet has been dredged and a slip with 2 concrete wharves and 1 storage shed has been completed. North of the slip and along the west side of the turning basin is a wooden wharf about 400 feet long. A set of mooring dolphins is in place on the east side of the turning basin and is used by yachts drawing too much water to go to the anchorage in the lake off Palm Beach. It has been reported that there is a depth of 17 feet (5.2 m) in the slip and 16 feet (4.9 m) along the outside face of the wooden wharf.

Pilots.—A vessel requiring a pilot may obtain one by making the usual signal.

Pilotage.—The following rates of pilotage have been prescribed for the Port of Palm Beach:

	Per foot
Under 6-foot draft	$2.00
6 to 10 feet draft	3.00
10 to 14 feet draft	4.00
14 to 20 feet draft	5.00
20-foot draft and upward	6.00

NOTE.—Foreign vessels pay full rate. United States vessels pay stated rates less 20 percent.

Anchorage.—There is no anchorage inside the inlet for boats drawing over 8 feet (2.4 m). Boats drawing less than this can go through a cut south of the wharves into the deeper water of Lake Worth. At high water, and with local knowledge, yachts drawing not over 9 feet (2.7 m) go south in Lake Worth and anchor off the Palm Beach water front north of the railroad bridge.

Supplies.—Gasoline, oil, and provisions can be obtained at the Port of Palm Beach or at West Palm Beach. Small boat and yacht supplies in limited quantities are available. Fresh water is piped to all the wharves. Coal must be ordered in advance, as no local supply is kept on hand.

Repairs.—Gas-engine repairs can be made, and there is a marine railway capable of hauling out a vessel of 4-foot (1.2 m) draft and 60 feet in length just north of the Port of Palm Beach. There is a boat yard and marine railway in West Palm Beach about ½ mile north of the northerly bridge. There is a marine basin and railway at Lantana on Lake Worth capable of hauling out vessels of 100 feet in length, 24-foot beam, and 7-foot (2.1 m) draft.

Towboats.—It is desirable at present to make advance arrangements for a towboat. A small gasoline towboat is usually available to assist vessels in entering and docking, if desired, and larger tugs can be sent from Miami on short notice.

Communications.—West Palm Beach and the port of Palm Beach are served by the Florida East Coast and Seaboard Air Line Railways. There is regular biweekly freight-boat service to northern ports.

Aviation fields.—**Belvedere Airport** is located 2 miles southwest of the city of West Palm Beach. There are three landing strips 1,800 by 200 feet, 2,300 by 600 feet, and 2,000 by 500 feet, respectively. There are facilities in the daytime for servicing aircraft.

Currie seaplane base is located 1 mile north of the center of West Palm Beach, on the west border of Lake Worth. There is a 50-foot ramp, anchorage facilities, and day and night facilities for servicing amphibians and flying boats.

Storm warnings are displayed from the post office in West Palm Beach.

Quarantine.—Vessels subject to quarantine inspection are boarded at the wharves on arrival.

LAKE WORTH INLET TO PORT EVERGLADES

(Chart 1248)

From Lake Worth Inlet the general trend of the coastline is south for 41 miles to Port Everglades. It is broken by several inlets of little importance. The coast is formed almost entirely by a low sand beach, with more or less conspicuous hills partly covered with grass

and scrub palmetto, back of which it is wooded. Extensive building operations have materially changed the appearance of this section of the shore line, and numerous tanks, towns, and scattered buildings are visible from seaward. Conspicuous from seaward are the buildings and pier at Palm Beach, the lighthouse at Hillsboro Inlet, and the large buildings and tanks at Fort Lauderdale.

The coast between Lake Worth Inlet and Port Everglades is fairly bold; the 20-fathom (36 m) curve runs parallel to the beach and for a greater part of the distance is less than 2 miles from it; inside this curve the shoaling is rapid, and 6 to 8 fathoms (10.9 to 14.6 m) are found in places 1½ miles from the beach.

Two small rocky islets, lying close together, are located 5 miles south of Hillsboro Inlet Lighthouse. They are 0.4 mile offshore and must be avoided by light-draft vessels sailing close along the edge of the reef. **Cumberland wreck**, the boilers of which show above water, is about ¼ mile north of the rocky islets. A nun buoy is placed northeastward of the wreck. A wreck 3 miles south of the lighthouse and 0.5 mile offshore has a depth of about 10 feet (3.0 m) over it at mean low water.

Lake Worth is a narrow, shallow body of water separated from the ocean by an island varying in width from about ½ mile to 200 yards. The main part of the lake lies south of Lake Worth Inlet. The **Intracoastal Waterway** traverses the lake from one end to the other. From the westward there is a drainage canal extending through the Everglades to Lake Okeechobee. This may be traversed by small boats, provided permission is secured in advance from the engineer in charge, Everglades Drainage District, West Palm Beach, Fla.

At the south end of Lake Worth a small dredged cut has been made through the outside beach. The cut is about 200 feet wide and 5 feet (1.5 m) deep at low water and is crossed by a fixed bridge. It is only used by small boats, with local knowledge, and then only at or near slack water. The currents through this cut have great velocity, and with an easterly wind it is impassable on account of breakers at the entrance. Since the channels to the ocean have been opened, it is reported that the range of tide in Lake Worth has increased considerably.

West Palm Beach is a city on the west shore of Lake Worth. The business district is about 3 miles south of the port of Palm Beach. It is of some commercial importance and is a division point on the Florida East Coast and the Seaboard Air Line Railways. Two highway and one railway bridge connect this city with the fashionable winter resort of **Palm Beach**, which is directly across Lake Worth from it. There are excellent hotel accommodations available in both cities.

Berthing space for vessels is limited. There is a depth of about 8 feet (2.4 m) along the offshore face and in the northern slips of the city wharf, which is about 400 yards south of the railroad bridge. There are several slips on the south side of this wharf with a depth of less than 4 feet (1.2 m).

Charges for berths are as follows: Pleasure boats, 1 cent per foot per day; party fishing boats, 1 cent per foot per day, payable in advance; nonresident charter boats, 2 cents per foot per day, payable yearly in advance. Fresh water can be secured at the dock at a charge of ¼ cent per gallon.

The channel from the **Intracoastal Waterway** to the city dock is marked by beacons and has a controlling depth of 8 feet (2.4 m).

There are numerous private piers. The yacht club wharf is north of the railroad bridge. It is approached on a course parallel to the railroad bridge. Yacht supplies and provisions can be had in the city. Repairs to hulls and machinery of launches can be made at West Palm Beach, at **Lone Cabbage Island**, 1 mile south of the city, and at Riveria, near Lake Worth Inlet.

Storm warnings are displayed from the flagpole on the post office in West Palm Beach.

Palm Beach is a fashionable winter resort, on the narrow island between Lake Worth and the sea. It is due east from West Palm Beach, with which it is connected by railroad and highway bridges. At this place there is an ocean pier, built for amusement purposes. The radio poles on the pier are prominent objects. Several other towns and cities are built along the shores of Lake Worth. For more detailed descriptions, see the **Inside Route Pilot, New York to Key West.**

Boca Raton Inlet is a dredged cut through the beach 5 miles north of Hillsboro Inlet Lighthouse. There is a short jetty on the north side of the entrance, but the channel is indefinite and changes with every storm. It is reported to have a depth of about 2 feet (0.6 m) at mean low water. This channel is sometimes used at high water by fishing boats, but should not be attempted by strangers.

Hillsboro Inlet is 31 miles south of Lake Worth Inlet. It connects with Hillsboro River and the **Intracoastal Waterway.** It is of no commercial importance, and in 1935 it was reported to have shoaled to about 2½ feet (0.8 m) at low water. It is occasionally used by small local fishing boats, but should not be used by strangers.

Hillsboro Inlet Lighthouse, lat. 26°15′32″ N., long. 80°04′52″ W., is located close to the beach, on the north side of Hillsboro Inlet. The lighthouse is an octagonal, pyramidal, skeleton tower, lower third white, upper two-thirds black. The light is flashing white every 20 seconds (flash 1 second, eclipse 19 seconds), 136 feet (41 m) above the water, and visible 18 miles.

New River Inlet is located 9 miles south of Hillsboro Inlet Lighthouse. It forms the entrance to **New River** and connects with the **Intracoastal Waterway.** New River forms the approach to the city of Fort Lauderdale and is important for this reason only. The entrance is marked by short jetties and has shoaled until the channel has almost disappeared. The entrance at Port Everglades is used by practically all craft. There is an important Coast Guard operating base close inside the entrance on the north side of the channel of New River Inlet.

Fort Lauderdale is a growing city on the Florida East Coast and Seaboard Air Line Railways. Provisions, gasoline, and fresh water can be obtained here. There is a repair shop for power boats and a marine railway of 100 tons capacity and a draft of 8 feet (2.4 m). Drawbridges cross the river at the town. Yachts usually lie alongside the bulkheads at the town or at the city dock. A charge is made for dockage at the city wharf of one-half cent per foot per day, or forty-five cents per foot per year. Two aviation beacons have been

established near Fort Lauderdale. See latest edition of chart 1248 for their positions.

There is a controlling depth of 8 feet (2.4 m) from Port Everglades through the Intracoastal Waterway and New River to Fort Lauderdale.

New River is said to be deep for a distance of 7 miles above Fort Lauderdale to the South New River Drainage Canal, which joins the canal from the Miami River to Lake Okeechobee. The North New River Drainage Canal enters this river about 1 mile above Fort Lauderdale and runs direct to the lake. About 6 feet (1.8 m) can be carried from Fort Lauderdale through the South New River and Dania Canals to the Intracoastal Waterway about 1½ mile south of Port Everglades; there is a limited overhead clearance of about 10 feet (3.0 m) at high water.

PORT EVERGLADES

(Chart 1248)

This new deep-water port, 20 miles north of Miami, is close to the Florida Atlantic ship lanes and borders on the Intracoastal Waterway. It has been made a customs port of entry.

A dredged channel, marked by a lighted range (both lights fixed red), leads directly from the sea to a turning basin and slip on the west side of the port. In July 1935 the controlling depth in the ship channel was 32 feet (9.8 m) from the sea buoy to the east side of the turning basin, and 33 feet (10.0 m) in the turning basin.

The ship channel and part of the turning basin were originally dredged to 35 feet (10.7 m) in rock bottom. The United States Engineers have taken over the maintenance of the channel, turning basin, and jetties.

Two converging angular stone jetties, 500 feet apart at their outer ends, protect the harbor entrance. They are 6 feet (1.8 m) above mean low water. Two lines of submerged mats of rock for proposed breakwaters extend about 1,500 yards seaward, one line on either side of the channel. The general depth over them is about 10 feet (3.0 m), and they are about 1,200 feet apart at their seaward ends.

Pilots.—Vessels requiring a pilot may secure one by previous notification. Pilotage is compulsory for all vessels in foreign trade drawing more than 6 feet of water. Vessels in the domestic trade, coastwise, are not required to take pilots, but such vessels are required to have on board a United States licensed pilot.

Pilotage.—The rates of pilotage for Port Everglades are based on the draft of the vessel and are as follows, inbound or outbound:

Rate A.—For all vessels in foreign trade making 1 to 3 trips or entrances per year.

Rate B.—For all vessels in foreign trade making 4 to 7 trips or entrances per year.

Rate C.—For all vessels in foreign trade making 8 to 12 trips or entrances per year.

Rate D.—For all vessels in foreign trade making 12 or more trips or entrances per year.

Half pilotage, based on the above schedule, shall apply to all vessels in domestic trade, coastwise, when a United States licensed pilot is aboard.

Pilotage rates

Draft of ship	Rate A	Rate B	Rate C	Rate D
6 to 10 feet	$20.00	$16.00	$15.00	$14.00
11 feet	23.10	18.48	17.32	16.17
12 feet	26.40	21.12	19.80	18.48
13 feet	29.90	23.92	22.42	20.93
14 feet	33.60	26.88	25.20	23.52
15 feet	37.50	30.00	28.12	26.25
16 feet	41.60	33.28	31.20	29.12
17 feet	45.90	36.72	34.42	32.13
18 feet	50.40	40.32	37.80	35.28
19 feet	55.10	44.08	41.32	38.57
20 feet	60.00	48.00	45.00	42.00
21 feet	65.10	52.08	48.82	45.57
22 feet	70.40	56.32	52.80	49.28
23 feet	75.90	60.72	56.92	53.13
24 feet	81.60	65.28	61.20	57.12
25 feet	87.50	70.00	65.62	61.25
26 feet	93.60	74.88	70.20	65.52
27 feet	99.90	79.92	74.92	69.93
28 feet	106.40	85.12	79.80	74.48
29 feet	113.10	90.48	84.82	79.17
30 feet	120.00	96.00	90.00	84.00
31 feet	120.00	96.00	90.00	84.00
32 feet	120.00	96.00	90.00	84.00
33 feet	120.00	96.00	90.00	84.00
34 feet	120.00	96.00	90.00	84.00
35 feet [1]				

[1] Maximum depth of Port Everglades.

NOTE: The charge for running lines when the pilot or pilot boat is used is as follows: $5 minimum, or $5 for the first hour, plus $3 for each additional hour.

Terminal facilities.—Slip No. 1, directly in line with the entrance, affords berthing space for several large vessels. Fuel oil and water are piped to the wharf. Fuel-oil storage capacity is 80,000 barrels. A steel warehouse has been built at the terminal, with railway and highway connections. The slip is 1,200 feet long by 300 feet wide, with steel bulkhead at the end and both sides, with a depth of water of 35 feet (10.7 m). The wharf is equipped with a 45-ton crane. The 3½-mile belt line is equipped with facilities for the moving and transferring of cargoes.

The turning basin lies adjacent to Slip No. 1, and extends about 1,200 feet eastward of the terminal, with a width of 1,200 feet (for depth see above.)

Dockage charges.—Charges for docking of passenger boats, freight boats, and private yachts at Port Everglades are made as follows:

Passenger boats: Two cents per foot of wharf occupied per day.
Freight boats: One cent per foot of wharf occupied per day (not applicable to boats discharging or loading cargo—wharfage charge given in tariff portfolio applies).
Private yachts: Two cents per foot of wharf occupied per day.

(All rates subject to confirmation)

Harbor dues.—

Tugs engaged in coastwise towing, per trip	$4.00
Vessels under 500 tons making weekly trips	4.00
Vessels under 500 tons	7.50

Vessels 500 tons and over	$10.00
Shifting vessels in the harbor in which pilots are not employed but harbormaster is employed:	
Vessels over 500 tons	10.00
Vessels under 500 tons	5.00
Running lines	5.00

Supplies.—Fuel oil for bunkering of ships is available in any quantity for shipside delivery. Coal can also be delivered direct to ships at the dock on short notice. An ample supply of water is available and is supplied from the city of Fort Lauderdale mains at the rate of 35 cents per net ton. Other supplies can be secured at short notice from Fort Lauderdale or Miami.

Towboats.—Tugs are available on call from Miami.

Quarantine.—Vessels subject to examination by the quarantine officer are boarded at sea or at the docks.

Communications.—There is regular freight-boat service to northern and Gulf coast ports. There is nearby autobus connection with Fort Lauderdale and Miami.

Tides.—The mean range of the tide in Port Everglades entrance is about 2½ feet (0.8 m). The tidal currents in the entrance are usually less than a knot at strength.

Directions for entering.—From the vicinity of *Port Everglades Lighted Bell Buoy* (Fl. W.) close **Port Everglades Entrance Range** ahead (both lights F. R.; front daymark, white and black diagonal striped diamond on skeleton tower, rear daymark, white and black diagonal striped circle on skeleton tower) and follow the range on course 269° true (W. ⅛ S. mag.) direct to the terminal slip. In addition to the range, the channel is marked on either side by several buoys, beacons, and lights.

PORT EVERGLADES TO CAPE FLORIDA

(Charts 1248 and 583)

Between Port Everglades and Cape Florida, 26 miles to the southward, the general trend of the coast line is south. The coast is formed almost entirely by a low sand beach. The large buildings and tanks in Hollywood, Miami Beach, and Miami are particularly conspicuous from seaward.

This section of the coast is also fairly bold and the 20-fathom (36 m) curve runs parallel to the beach at a distance of about 2 miles until in the vicinity of Miami entrance, where the curve of the shore becomes south-southwestward and the 20-fathom (36 m) curve lies about 4 miles offshore. Inside of this curve, between Port Everglades and Cape Florida, the shoaling is rapid, and northward of Miami entrance 6 to 8 fathoms (10.9 to 14.6 m) are found in places 1¼ miles from the beach.

Fulford Beach Lighted Buoy 4 (Fl. W.) is moored in 60 feet (18.3 m) 1½ miles off the coast midway between Port Everglades and Miami entrance.

In 1927 several ships reported striking submerged objects, probably moving wreckage, when approaching Miami entrance from northward and in the vicinity of the 10-fathom (18.3 m) curve, about 4 miles from the anchorage area.

Hollywood is a resort city of importance about 4½ miles south of Port Everglades and about a mile west of the **Intracoastal Waterway.** The Hollywood Hotel, a very prominent structure, is situated on the ocean beach east of the city. Vessels navigating the **Intracoastal Waterway** lie at the dock in the lagoon northwest of the hotel or at the small wharf on the east side of the waterway just north of the highway bridge. Gasoline can be obtained here. There are no facilities for repairs of any kind.

The **wreck of the Steamship Elizabeth,** lat. 25°47.8′ N., long. 80°06.7′ W., lies in 15 feet (4.6 m) of water, 0.75 mile off Miami Beach. The wreck is marked by Elizabeth Wreck Light (Fl. R.), 26 feet (7.9 m) above the water.

Biscayne Bay is a large shallow body of water, commencing in latitude 25°55′ N. and extending in a southerly direction about 33 miles to Card Sound. For the first 10 miles the bay has a width of about 2 miles and is separated from the Straits of Florida by a narrow peninsula and Virginia Key and Key Biscayne. For the remainder of the distance the average width of the bay is nearly 7 miles, and it is separated from Hawk Channel by a number of keys and coral banks, between which there are several narrow and shallow passages. A great part of the bay has depths of 9 and 10 feet (2.7 to 3.0 m), and there are a few places with depths of 13 to 15 feet (3.9 to 4.6 m) but near its head it is very shallow. South of Cape Florida, on Key Biscayne, the bay has little importance.

The north end of the bay is the center of an extensive commercial development that has entirely changed the shore line and the channel depths. The city of Miami Beach occupies the peninsula that separates the upper part of Biscayne Bay from the ocean. Miami now covers practically the whole of the west side of the bay north of Key Biscayne. These two cities, together with adjoining cities, form a unit known as Greater Miami. Greater Miami is the most important commercial center of the coast south of Jacksonville. The winter-tourist trade accounts for the biggest part of the business of the port. Biscayne Bay is unexcelled as a yachting and small-boat center, and much of the prosperity of the surrounding cities depends on it.

Prominent objects.—The group of skyscrapers in Miami and the large hotels at Miami and Coral Gables form landmarks visible for miles in all directions. Among those most easily distinguished are the courthouse dome, the Daily News tower, and the Everglades Hotel tower in Miami, the Roney Plaza Hotel tower and an amusement pier on the east water front at Miami Beach, and the Miami Biltmore Hotel southwest of Miami, at Coral Gables. Cape Florida unused lighthouse tower, a white tower on the south point of Key Biscayne, is easily distinguished. An aeronautical light has been established about 7 miles northwest of Miami. Numerous other tanks and towers shown on the charts need no description.

Miami River trends westward, through the southern part of the city of Miami to the Everglades. The river has recently been dredged to a controlling depth of 15 feet (4.6 m) from its mouth to the Thirty-sixth Street bridge in Miami and is navigable for a draft of 6 feet (1.8 m) in the drainage canal to the Pennsylvania Sugar Mills, about 16 miles from Biscayne Bay. Beyond this point the river is closed

to navigation. In July 1935 the controlling depth was 12.8 feet (3.7 m).

The main entrance is now north of Burlingame Island and runs close along and southeast of the Royal Palm Yacht Basin. To enter the river through this channel pass southward through the turning basin off the city park and stand through the channel into the river passing about 100 feet off the Royal Palm Yacht Basin. The river can be entered with a controlling depth of 8 feet (2.4 m) by following the channel ranges through the dredged channels east and southwest of Burlingame Island. Vessels from the southward use this route.

14. MIAMI HARBOR AND MIAMI

(Chart 583)

Miami is the principal city on Biscayne Bay and the most important city on the Atlantic coast south of Jacksonville. It is a popular winter resort and is growing in commercial importance. It is on the main line of the Florida East Coast Railway and is the southern terminus of the Seaboard Air Line Railway. This gives excellent communication with all northern cities and with Key West and Habana on the south. It is an important yachting center, especially in winter, and a large number of small boats operate out of the port, angling and cruising along the Florida Keys. In addition to steamer connection with northern cities, there is a steamer running to Nassau and to Habana, Cuba.

Miami Beach is a winter resort located on the peninsula and the outside beach, east of Miami and Biscayne Bay. Several bridges cross the bay, forming good highway connection with Miami. This city is wholly residential. On the southwest end of the city, south of the county causeway and just inside the jettied entrance of the main channel, are located the only commercial wharves. The municipal wharf is located at this point with a depth of 19 feet (5.8 m) alongside and in **Meloy Channel**, connecting with the main channel. Numerous small wharves are located along the west side of the city, which are used entirely by pleasure craft. The east side of the city, fronts directly on the ocean. There is an amusement pier extending out into the ocean, about ¼ mile north of the jetties. Numerous other structures are prominent from seaward, several of which are located on chart 583. For port facilities, see below.

Coconut Grove is located about 4 miles southwest of Miami. A channel with a controlling depth of 8 feet (2.4 m) at mean low water and well marked by beacons leads from the deeper waters of Biscayne Bay to the docks. The Pan American Airport and the Biscayne Bay Seaplane Base (Coast Guard) are located at Dinner Key. There is a marine railway at Coconut Grove with a capacity of 1,500 tons, 150-foot length and 10-foot (3.0 m) draft.

Coral Gables is a city adjoining Miami on the southwest. The waterfront is unimportant. A canal has been dug through the coral rock to form an approach to a proposed yacht club. The canal is crossed by fixed bridges with limited clearance. It is reported that a draft of 4 feet (1.2 m) can be taken into the mouth of the canal

Miami, Fla., at night from Biscayne Bay; (1) Everglades Hotel tower; (2) courthouse; (3) News tower.

at mean low water. There is an important landmark, the tower of the Miami Biltmore Hotel at Coral Gables, which shows well over the lower part of Biscayne Bay and the approach to Miami from the southeast.

Pilots.—Pilotage is compulsory for certain vessels. The pilot station is at Miami Beach, on the end of the pier, close to the North Jetty. The pilot boat will come out to meet any vessel making signal for a pilot.

Pilotage.—The following are extracts from the rules adopted by the Board of Pilot Commissioners:

The rates as given below shall apply to all steamers or vessels, whether owned wholly by citizens of this State or not: provided, that all steamers or vessels carrying the regular United States mail shall pay half pilotage only: provided further, that all steamers or vessels drawing less than six (6) feet of water, and having coastwise license, shall be exempt from paying whole or half pilotage, unless they employ a pilot.

34. Any pilot detained on board of any vessel by the master or quarantine officer shall receive from such vessel for each and every day's services the sum of $4 per day over and above his pilotage.

35. The rates charged for placing letters or orders on board any vessel shall be one pilotage; this rate shall apply to vessels seeking and not taking cargo. The maximum charge for taking a physician out to any vessel or for taking any sick or injured person from such vessel shall be $75.

36. The master of any vessel subject to pilotage entering the Port of Miami, who does not accept the services of a pilot, shall be compelled to pay the regular legal rates of pilotage: *Provided*, That services of a pilot are offered such vessel outside the entrance bar buoy to Miami Harbor.

37. All vessels subject to pilotage crossing the bar, either in or out, shall be required to pay full pilotage to the pilot offering his services, whether such craft to be in tow or otherwise.

38. Every master of a vessel who shall detain a pilot after the time appointed, so that he cannot proceed to sea, though wind and water should permit, shall pay such pilot $10 per day, or fraction thereof exceeding one-half hour, during the time of his actual detention; and if any vessel which shall be boarded by a pilot without or within the harbor limits, shall by violence of the weather or otherwise be driven to sea the master or owner of such vessel shall allow and pay the pilot $10 per day, or fraction thereof exceeding one-half hour, for every day he shall be on board, besides the fee of pilotage.

40. All vessels at anchor or under way within the bar at night shall exhibit a light in some conspicuous place, at least ten feet above the deck, so as to be seen by vessels or boats passing, under a penalty of $100 for each and every neglect, and shall also be liable for all damages or the amount of injury sustained by any vessel or boat coming in contact with such anchored vessel because of the absence of such light. And it shall be the duty of the pilot to notify the master of each vessel coming over the bar of the existence of this requirement.

Pilotage rates.—The rates for pilotage are as follows:

	Per foot
6 feet or less draft	$2.00
6 to 10 feet draft	2.50
10 to 13 feet draft	3.00
13 to 17 feet draft	4.00
Over 17 feet draft	5.00

Channels.—**The Main Channel** is a dredged cut from the 30-foot (9.1 m) contour, through the jettied entrance south of Miami Beach, and thence across the flats in Biscayne Bay to the municipal piers on the Miami water front. An extension of this channel leads to the railroad pier south of the municipal piers. In crossing the bay this channel runs parallel and close to the Miami Causeway.

There is a shoal marginal strip about 100 feet wide between the northern edge of the channel and Miami Causeway along its entire length. Lights marking this channel are established about 25 feet back from the edges of the channel. Vessels are advised to favor the south side of the channel during southerly winds as a pronounced northerly set of current may then be experienced.

The present project calls for a 30-foot (9.1 m) channel, with a width varying from 500 feet at the ocean end to 300 feet in the passage across the bay. In December 1935 full depth was available in all parts of the channel. The turning basin off the municipal piers has a controlling depth of 30 feet (9.1 m). There is a controlling depth of 13 feet (4.0 m) in the channel to the Florida East Coast Railway piers, with the same depth alongside.

Miami Beach Channel (Meloy Channel) branches from the Main Channel at the inside end of the jetties and extends northwestward along the west shore of Miami Beach as far as the causeway bridge. It is reported that the depth in this channel and at the wharves on the east side of the channel is 19 feet (5.8 m) at low water.

A channel about ½ mile westward of the Miami Beach Channel leads northwestward from the Main Channel to the Miami Causeway. The controlling depth in this channel is reported to be 18 feet (5.5 m) at mean low water.

Fishers Island Channel branches from the Main Channel just inside the jetties and extends westward for about 1,200 yards along the north side of Fisher Island to the Belcher Oil Co. property, and is maintained at a depth of 25 feet (7.6 m). The channel westward of this point and on the west side of the island is maintained by private interests to a depth of 20 feet (6.1 m).

The **Railroad Channel** extends westward from Fishers Island Channel to the city water front. This channel is no longer maintained and is little used except by local interests. It is poorly marked. The controlling depth, according to surveys in 1935, was 8 feet (2.4 m). From this channel a natural channel with a controlling depth of 7 feet (5.2 m) leads to the southward. It is also little used and is not marked.

Biscayne Channel leads through the shoals south of Cape Florida into Biscayne Bay. It is partly dredged, and there are shoals close to the channel line in places. Care must be used with boats that are close to the limiting depth of the channel. The route is well marked and easily followed in daytime. The directions given are good for 8 feet (2.4 m), but it is reported that, with local knowledge, 10 feet (3.0 m) can be taken to the city wharves via this channel. Several channels lead through the shoals between Biscayne Channel and Key Biscayne which are much used by local boats. For these channels the chart is a good guide.

South Channel is a dredged cut leading from Biscayne Bay, northward of Key Biscayne, to the Miami city water front. The **Intracoastal Waterway** southward to Key West passes through this channel. One branch of it leads into the Miami River and the other leads directly into the turning basin off the city park. Between these two branches there is a connection which runs close along the Royal Palm Yacht Basin. South Channel and the two main branches are reported to have 11 feet (3.4 m) at low water. The

connecting channel into the Miami River alongside the Royal Palm Yacht Basin has a controlling depth of 15 feet (4.6 m) at mean low water.

Small-boat channels.—The area between the two causeways connecting Miami and Miami Beach is used as an anchorage by yachts and small boats. There are numerous slips and wharves on the made islands in this area. There are no marked channels but the depths are ample, from 9 to 10 feet (2.7 to 3.0 m), for the size of craft that use them. Local knowledge is necessary for navigation in this area.

A channel, marked by private temporary markers, follows the east shore of Biscayne Bay northward from the Miami Beach (Meloy) Channel. The channel has a controlling depth of 9 feet (2.7 m) to the Venetian Causeway and 8 feet (2.4 m) beyond it and is used by the owners of the various estates in this vicinity.

Directions.—From the Miami Causeway Bridge at Miami Beach follow a midchannel course until the Flagler Monument bears west (mag.); then head for the draw of the Venetian Causeway bridge. After passing through the draw, follow the shore of Belle Island at a distance of about 200 feet until north of the northern point, then head east until about 100 yards offshore. Thence head north and follow the shore at a distance of about 100 yards. The turns in the channel are usually marked by an iron stake.

An unmarked channel permits a draft of 9 feet (2.7 m) to be carried from the **Intracoastal Waterway** to the channel described immediately above. The channel follows parallel to the north points of the Venetian Islands and about 100 yards offshore. Local knowledge is necessary for the navigation of this channel.

Collins Canal leads northeasterly, along the southeast side of the highway prolongation of the Venetian Way, to Indian Creek. The controlling depth in the canal is 4 feet (1.2 m). Navigation is limited by the fixed bridges crossing the canal.

The **Intracoastal Waterway** northward from Miami through Biscayne Bay has a controlling depth of 8 feet (2.4 m) and is well marked by beacons.

The harbor master.—

42. The harbor master's jurisdiction shall extend over all waters within Miami Harbor limits and all waters within Dade County.

43. The harbor master is an ex-officio member of the board of pilot commissioners, and as such shall carry out all rules and regulations of the pilot commissioners and shall be the operating force through which the pilot commissioner's rules and regulations for the harbor of Miami are enforced. He shall have full police powers upon all the waters, wharves, etc., within the harbor limits and wherever his duty may take him.

44 The harbor master will be a deputy sheriff with all powers of same, and any law case he is required to handle will be presented by him to the proper county officials.

45. The harbor master shall appoint a deputy for Miami Beach.

46. It shall be the duty of the harbor master, in addition to such other duties as may be imposed on him from time to time, personally to see that all the regulations of this port looking to the safety and convenience of the vessels arriving, remaining in, and leaving the same, shall be properly observed and kept; and to this end he is required from time to time, and as often as may be necessary, to inspect the wharves, docks, and places of anchorage in this port, and observe the location of the vessels using the same. All vessels shall be anchored fore and aft in the fairways. He is required to keep the channel way and track of vessels clear at all times.

47. The harbor master and his deputies, while on duty, shall be uniformed in white or blue cloth; the cap to be a regulation yachting cap, bearing the insignia of his office in gold letters, such as "Harbor Master", "Deputy Harbor Master."

48. All vessels of 50 tons net register and over shall pay the harbor master of the port of Miami the following fee, according to tonnage, which will entitle the vessel to the harbor master's services prescribed by the port and harbor regulations, without further charge, while the vessel remains in port; the sum of not exceeding $20 according to the amount and value of the services rendered.

49. In the event of failure or refusal on the part of any master to pay the fees herein prescribed, the harbor master is authorized to go before any justice of the peace and sue out a warrant against said master for such failure or refusal, or, as he sees fit, to present the facts to the county solicitor for criminal prosecution.

50. It shall be the duty of the harbor master to supply himself with a boat not less than 20 feet nor longer than 50 feet, heavily constructed, with not less than a 35-horsepower engine, capable of a speed of 12 miles or better, for the performance of his work of making inspections, going to the assistance of any pilot boat or other boat needing his services, etc., said boat to be moored or tied in close proximity to the harbor master's office when not in use and plainly marked in letters of a contrasting color to the boat, that may be plainly seen, of not less than 12 inches in height, with the words, "Harbor Master" on each side, amidships. This boat and equipment must first be approved by the board of commissioners before being put in service by the harbor master, and shall be constantly maintained in good and seaworthy condition and subject to the approval of the board.

51. The master or consignee of any vessel wishing to move shall give the harbor master sufficient notice to enable him to give her a clear berth. The harbor master must be the judge of the time required.

52. The harbor master may remove any vessel or vessels moored to the ends of the wharves, or on either side of a dock, or lying in any part of a dock, which may be necessary, in his opinion, to expedite and render more safe and convenient the entrance or departure of any other vessel or vessels hauling at the time in or out of said dock.

53. The harbor master shall cut the fast or fasts of any vessel, or cause the same to be cut or cast loose, when the captain or the person in charge of such vessel refuses or neglects to slack her fasts, and to remove his vessel for the proper accommodation of another vessel passing in or out of her berth, or refuses to give up the inside berth, or to remove and moor his vessel in conformity with the foregoing regulations, or with the orders of the said harbor master.

54. Whenever the harbor master shall require the services of a tug to enforce an order for the removal of a vessel against the will of a master, the charge of the tug for such service may be guaranteed to be paid by the board; but it shall be the duty of the harbor master to collect the costs, fines, and fees for such removal from the offending vessel by warrant in the name of the board. The harbor master will see that due notice of this section is served on the master of all vessels.

55. Vessels when not engaged in loading or discharging cargo shall give place to such vessels as are ready to receive or deliver freight. And if the captain or any person in charge of any vessel refuses to move said vessel when notified by the owners or agents of the wharf at which she is lying, the harbor master shall order him to haul to some other berth, or into the stream, and should the captain or the person in charge refuse to obey the orders of the harbor master, then the harbor master shall himself move the vessel at the owner's expense, by the use of a tug, if necessary, and shall be entitled to the usual fee, to be recovered from the owners of the offending vessel with the costs of such removal.

56. The harbor master shall determine also how far and in what instances it is the duty of the masters and others having charge of ships and vessels to accommodate each other in their respective berths and situations.

57. All differences between the masters of vessels moored at the same wharf or in adjacent docks, and of vessels in the stream, with respect to the location and space occupied by their respective vessels, or the interfering with each other at their moorings, shall be referred to, adjusted, and settled by the harbor master upon proper presentation thereof.

58. The harbor master shall have the right to appoint a deputy harbor master to serve as acting harbor master in his absence, and such deputy shall

have all the powers and authority of the harbor master while serving as acting harbor master.

59. The harbor master shall keep a daily record of events pertaining to his office in a log book, the same as any ocean-going ship, and shall submit a copy of it the first Monday of each month to the Board of Pilot Commissioners at the time that the pilots submit their report.

60. The harbor master will consult the United States Weather Bureau three times each day for the weather conditions, at 8 a. m., 12 m., and 5 p. m. daily, and as often as is necessary and with especial frequency when serious storms are brewing. The harbor master must keep himself informed of the weather conditions at all times.

61. At the approach of any serious storm the harbor master is authorized to hire laborers, not to exceed 10, at a rate of not to exceed $5 per day each, to assist him in his duties preceding any serious storm or hurricane.

62. The harbor master will report to the board any breach of regulations that he may notice among the pilots.

63. The harbor master will at all times give every assistance that he can to the police forces of the cities of Miami, Miami Beach, Coral Gables, Hialeah, and Coconut Grove.

64. The harbor master is not required to file aboard vessels on arrival a copy of these rules and regulations, but a delivery of same to the agent or broker of such vessels shall be deemed due notice in law to such vessel.

Harbor regulations.—

65. No vessel shall anchor in the bay, river, or canals, or extend her fasts so as to interrupt the navigation of said bay, river, or canals, or the passage of the ferryboats to and from the usual place of landing on either side of the bay, river, or canal. Each day shall be considered a separate offense.

66. No vessel shall extend her hull, bowsprit, yards, rigging, or fasts so as to interrupt the passage in or out of the public docks, under the penalty of $5 for each and every hour said offense shall continue after notice from the harbor master.

67. No master or owner of a vessel shall disobey or neglect such orders and directions as may be given by the harbor master, in times of hurricane or gales of wind, relating to the safety of vessels and property in the harbor.

68. No vessels having on board grain, fish scrap, or articles evidently in a state of putrefaction or offensive shall haul to or lay at any wharf, but shall anchor at a station to be designated by the harbor master, until the order of the boat shall be known, under the penalty of $100 for each and every hour such offense shall continue after notice from the harbor master. Nor shall any vessel discharge offensive bilge water within the harbor limits or in any of the waters of Dade County.

69. Should any hulk, raft, flat, or other obstructive substance become sunken, from any cause, in the harbor, the same shall be immediately removed by the person owning same or having custody thereof; and in case efforts are not immediately made for the removal thereof, the commissioners may exercise their discretion of using other means of abating the nuisance, even to the confiscation or condemnation of such obstructions.

70. No private or public docks, wharves, or spillways shall be incumbered with logs, boats, dilapidated hulks, or other trash of nuisance of any kind; and if any such incumbrance be not removed immediately upon notice from the harbor master, every day or fraction thereof the nuisance remains in existence shall constitute a separate offense. And when the owner cannot conveniently be found, the harbor master shall take the most speedy method to clear the dock, wharf, or spillway.

71. No flat, or raft, or any boat or vessel shall be cast loose or adrift without the consent of the harbor master.

72. Any master or other person having charge of any vessel, boat, barge, flat, or raft who shall refuse or neglect to obey the directions of the harbor master in any matters within his authority, or shall molest, resist, or oppose the harbor master in the execution of any of the duties of his office, forfeit and pay a fine not exceeding $100 or be imprisoned not exceeding 60 days (7995 C. G. L. 1927).

73. Every vessel must always have on board a shipkeeper or person capable of taking care of her, or some arrangements must have been made for her care under all conditions.

74. No vessel shall be graved at any wharf or in any of the docks where vessels load or discharge.

75. Every ship, vessel, or steamer lying in one of the docks or moored to a wharf shall keep a light burning on board thereof from dark until daylight, said light to be suspended conspicuously amidships, 10 feet above the deck of the vessel. The master, owner, or other person having charge of any ship, vessel, or steamer making default herein shall be liable to a penalty of imprisonment not exceeding 60 days or a fine not exceeding $10.

76. Any water-logged vessel coming into the port of Miami with cargo on board shall notify the harbor master before docking in the port. Until receiving instructions as to docking in said port, such vessel may anchor in the old channel just north of Fisher's Island. All other vessels arriving, whether light or with cargo, shall anchor off Fisher's Island, in the old channel just north of Fisher's Island, until receiving orders from the harbor master as to dockage or anchorage.

77. No vessel using fuel oil is permitted to discharge such oil from its tanks or bilges into the waters of the harbor or of Dade County. If necessary to discharge such oil, they are required to discharge with a lighter, which lighter shall not be permitted to discharge same in the harbor limits or within Dade County.

78. All ashes from the fireroom shall be placed on deck and protected so that same will not go into the harbor. Ash chutes shall be kept on deck instead of over the rail. No ashes shall be dumped in the water of Dade County.

79. Commercial vessels that do not hire bar pilots shall call up the pilot station at Miami Beach and ascertain if the channel is clear for them to proceed to sea; this to be in conjunction with the harbor master's orders.

80. No temporary or permanent moorings shall be placed in any of the waters of the port of Miami without first getting permission from the harbor master or his deputies, the deputy to make a report to the harbor master what permission he has issued.

81. No vessel of any description shall anchor or lie in the fairway or channel, or any fairway in the waters of the port of Miami, from the sea to the turning basin or in the turning basin. Fine of not exceeding $100 or 60 days in jail.

82. Foreign ships shall not enter the harbor after 5 p. m., except in case of bad weather when anchorage is needed.

83. Masts and stacks of small boats shall be provided with hinges so that they may pass under the draws and the drawbridges will not have to be unnecessarily lifted and delays caused to traffic on causeways or bridges.

84. All barges shall be numbered and lettered with the name of the owner on each side in 12-inch letters and numbers, and shall show two red lights on the after part of the barge at night while in tow.

85. Scheduled ships shall have right-of-way of all traffic in the main channel from the turning basin to sea or vice versa.

86. Vessels of any description shall not open their exhausts on rivers, canals, or creeks; nor in the bay not less than 250 feet from shore.

Anchorage of explosives.—87. No vessel having gunpowder, dynamite, or nitroglycerine, or any other explosive substance on board shall approach any wharf nearer than 100 fathoms. Such vessels shall anchor out of the way of passing steamers, and shall keep a red flag flying in main rigging while receiving or discharging powder. The handling of powder, dynamite, or nitroglycerine or any other explosive substance to and from vessels in the harbor must be under the supervision of the harbor master, whose duty it is to see that every precaution against danger of ignition or explosion is adopted and rigidly observed.

88. Vessels carrying explosives shall be anchored only within the anchorage ground described above under the heading "Anchorage for Explosives", which may be used also by vessels carrying other classes of freight when proper anchorage space is not available elsewhere in the harbor, including the connected rivers.

The term "high explosives in bulk" shall be construed to mean high explosives packed in boxes, barrels, or kegs and not loaded in ammunition or shells. The standard definition of the term "high explosives" will be that contained in paragraph 1503 of the regulations of the Interstate Commerce Commission for the transportation of explosives by rail, viz: "High explosives are all explosives more powerful than ordinary black powder, except smokeless powder and fulminates. This distinguishing characteristic is their susceptibility to detonation by a blasting cap. Examples of high explosives are the dynamites, picric acid, picrates, chlorate powders, nitrate of ammonia powders, dry

trinitrotoluol, dry nitrocellulose (gun cotton), and fireworks that can be exploded en masse." Unless they are loaded in the same vessels with articles enumerated in the rate quoted above, picric acid 10 percent wet, and trinitrotoluol 10 percent wet, and nitrocellulose (gun cotton) 20 percent wet will not be classed as high explosives.

The term "high explosives in bulk" does not include such articles as benzol, toluol, smokeless powder, black powder, small-arms ammunition, ammunition for cannon with explosive projectiles, explosive projectiles or torpedoes, percussion fuses, time fuses, combination fuses, tracer fuses, cordeau detonant, primers for cannon and small arms, blasting caps, detonating fuses, and fulminate of mercury in bulk. Blasting caps, detonating fuses, and fulminate of mercury in bulk will be considered as constituting a distinct class by themselves. The act of Congress approved March 4, 1921, imposes certain restrictions upon the transportation of explosives by common carriers engaged in interstate or foreign commerce, and also provides that "The Interstate Commerce Commission shall formulate regulations for the safe transportation within the limits of the jurisdiction of the United States of explosives and other dangerous articles, including inflammable liquids, inflammable solids, oxidizing materials, corrosive liquids, compressed gases, and poisonous substances, which shall be binding upon all common carriers engaged in interstate or foreign commerce which transport explosives or other dangerous articles by land or water, and upon all shippers making shipments of explosives or other dangerous articles via any common carrier engaged in interstate or foreign commerce by land or water." Other vessels will be governed by the following rules: (*a*) Where blasting caps, detonating fuses, and fulminate of mercury in bulk are located on the same vessel with high explosives, they must be in a different compartment, the distance in a straight line from the compartment containing them to the explosives to be not less than 25 feet. (*b*) In transferring high explosives in bulk, blasting caps, detonating fuses, and fulminate of mercury from one vessel to another they must be handled by hand or regulation chute and mattress.

If difference in elevation between vessels or condition of weather render it impossible to transfer or load by hand or chute, mechanical hoists and a special crate or basket may be used. Explosives transferred in this manner must not be handled roughly. They must be hoisted and lowered carefully and only deposited or lowered on a mattress.

89. Vessels carrying high explosives shall be at all times in charge of competent persons and must display by day a red flag, of at least 16 square feet, at the masthead, or at least 10 feet above the upper deck if the vessel has no mast; at night a red light shall be displayed in the same position specified for the red flag. No smoking will be permitted on or near such vessels, and no person under the influence of liquor will be allowed on board any vessel, barge, or scow carrying explosives, nor will he be allowed to approach such vessels.

90. Nothing of these rules and regulations shall be construed as relieving the owner or person in charge of any vessel from the penalties of the law for obstructing navigation, or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, etc.

Speed limits.—91. Speed: This is a very important matter in such a small harbor as Miami, and vessels and boats of all descriptions will carefully observe the following rules:

(*a*) On the Miami River, 6 miles per hour.

(*b*) From mouth of Miami River, south, 6 miles per hour until striking the main channel, then there is no speed limit, except ship's officers must use discretion in passing smaller craft at a high rate of speed, so as not to endanger life.

(*c*) From the mouth of the Miami River to the Government Cut by the old channel, no speed limit.

(*d*) From the mouth of the Miami River, north along Bayfront Park, the city yacht basin and 400 feet north of same, 6 miles per hour.

(*e*) Main channel, no speed limit.

(*f*) The channel between the two causeways to Miami Beach, no speed limit.

(*g*) In the channel north of the Venetian Causeway, no speed limit.

(*h*) Between the east drawbridge on the County Causeway and the east drawbridges of the Venetian Way, no speed limit, if the boats are held squarely in the channel, but any boat using the waters between these two points, and for 200 feet from the shore, 6 miles per hour.

(*i*) North of the east drawbridge of the Venetian Way, around Bell Isle to Fisher's slips, 6 miles per hour.

(*j*) In Indian Creek, Miami Beach, and in all canals in Dade County, 6 miles per hour.

(*k*) From Fisher's slips, north, no speed limit.

(*l*) From the west drawbridge of the Venetian Way in the main channel to the northern boundaries of the bay, no speed limit.

92. High-powered vessels shall not pass each other at a speed of more than 15 miles per hour. When passing smaller boats, such as row boats and the like, all vessels and power boats must slow down so that such small boats will not be endangered.

93. All tugs and other vessels towing, being in tow, or running light shall keep to one side of the channel when a ship is passing in either direction.

94. When passing the causeway dock, vessels shall slow down to only such speed as will give steerage way. This is left to the judgment of the master and pilots.

95. Any vessel or boat which causes damage to other crafts by suction or the swell from such vessels shall be responsible for any damage which may occur by reason thereof, if the injured vessel has taken reasonable safety precautions.

96. Speed limits for the canals, rivers, and creeks in Dade County shall be 6 miles per hour.

Penalty.—97. Whoever violates any of the foregoing rules or regulations shall be punished by imprisonment not exceeding 60 days, or by fine not exceeding $100 as provided by section 7995, Compiled General Laws of Florida, 1927.

Wharves.—According to surveys in 1935, the depths at mean low water at the wharves in Miami Harbor were as follows:

Miami Beach (Meloy Channel)	19 feet (5.8 m)
Causeway Slip, west end Miami Causeway	15 feet (4.6 m)
Municipal Pier I, east end	17 feet (5.2 m)
Municipal Pier I, south face	21 feet (6.4 m)
Municipal Pier II, north face	22 feet (6.7 m)
Municipal Pier II, south face	21 feet (6.4 m)
Municipal Pier III, north face	23 feet (7.0 m)
Municipal Pier III, south face	20 feet (6.1 m)
Florida East Coast Railway Pier	13 feet (4.0 m)
City Yacht Basin	5 to 17 feet (1.5 to 5.2 m)
Royal Palm Yacht Basin	6 feet (1.8 m)

The principal wharves in the Miami River can accommodate any boats able to enter the river.

City Yacht Basin dockage rates.—The following are the dockage rates for private yachts at the City Yacht Basin:

A daily rate of 3 cents per foot per day to be charged the year around, with a charge of $1.50 per thousand or 25 cents per hundred gallons of water for any yacht laying less than 4 days continuous at the dock.

A monthly rate of 2½ cents per foot per day from December 1 to April 1 and ½ cent per foot per day from April 1 to December 1, payable in advance.

A season rate of 2 cents per foot per day may be had upon payment of December and March in advance.

A yearly rate may be had at any time upon payment of a year's dockage in advance at 1 cent per foot per day, with a 10-percent discount. A discount of 5 percent may be had upon payment of any 6 months in advance.

All yachts laying alongside of another yacht will be charged half the regular rate except for one row boat.

From November 1 to May 1, any yacht reserving space in advance shall pay one-half of the regular rate in advance of arrival, and regular rate thereafter.

Any yacht on daily or monthly rate leaving for a week or more may reserve a berth at one-half regular rate, but must give approximate date of return on leaving and 24 hours' notice of arrival.

City of Miami reserves the right to use space when known to be vacant.

Anchorages.—There is no available anchorage for ocean-going vessels inside Miami Harbor. Such vessels must use the anchorage grounds described below. Yachts and small craft usually lay alongside the various wharves, but in winter such accommodations are

crowded and a large number of these boats anchor between the two causeways in the vicinity of Star Island or lie to moorings off the city yacht basin.

Anchorage ground.—The area to the eastward of a line bearing 12° true through a point *X*, which is 1¼ miles due east of the intersection of the Miami Beach shore line with the north jetty; to the northward of a line bearing 102° true and intersecting the 12° line at a point *A*, ½ mile north of the said point *X*; and to the southward of a line bearing 102° true and intersecting the 12° line at a point *B*, 2½ miles north of the said point *X*.

Rules and regulations for the above anchorage ground have been prescribed as follows:

1. Except in cases of great emergency, no vessel shall be anchored in the Atlantic Ocean in the vicinity of the entrances to the approach channels leading to the cities of Miami Beach and Miami, Fla., outside of the anchorage area hereby defined and established; that is, they shall not anchor shoreward of the first named nor southward of the second, nor northward of the third line, but may anchor as far to the eastward as may be desired.

2. Any vessel anchoring under circumstances of great emergency outside of the anchorage area shall be shifted to new berths within the area immediately after the emergency ceases.

3. All vessels shall lie at anchor with as short a cable as conditions will permit.

4. A vessel upon being notified to move into the anchorage limits or to shift its position on the anchorage ground must get under way at once or signal for a tug and must change position as directed with reasonable promptness.

5. Whenever the maritime or commercial interests of the United States so require, the engineer in local charge, United States Engineer subotfice, Miami Beach, Fla., is hereby empowered to shift the position of any vessel anchored on the anchorage ground or outside thereof, or of any vessel moored or anchored so as to impede or obstruct vessel movements or obstruct or interfere with range lights.

6. Vessels carrying explosives shall be anchored only under a written permit issued by the engineer in local charge and at such point as he may direct.

7. Vessels carrying explosives shall at all times be in charge of a competent person and must display by day a red flag of not less than 16 square feet at the masthead or not less than 10 feet above the upper deck if the vessel has no mast; at night a red light shall be displayed in the positions specified for the red flag.

8. Nothing in these rules and regulations shall be construed as relieving the owner or person in charge of any vessel from the penalties of the law for obstructing navigation, or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or other aids to navigation, or for otherwise violating law.

Quarantine.—The quarantine station is on Fishers Island on the south side of the main channel just inside the jetties. Vessels are boarded off the station.

United States Public Health Service.—There is a relief station of the Public Health Service at Miami. The nearest marine hospital is at Key West.

Storm warnings are displayed from the flagpole at the city yacht basin.

Towboats are usually available for any kind of towing that may be desired at this port.

Supplies and provisions of any kind can be obtained in Miami. Gasoline, fuel oil, and lubricating oils may be obtained from wharves or lighters. Fresh water is piped to most of the wharves. Coal in limited quantities is always available. Large quantities may be obtained by giving notice in advance.

Repairs.—Ordinary repairs to machinery and gas engines can be made at Miami and Miami Beach. There are facilities for hauling out launches, yachts, and small craft of not more than 400 tons and not over 8-foot (2.4 m) draft. The shipyard in Miami River has a marine railway capable of handling vessels of 1,500 tons and 13 feet (4.0 m) draft. Heavy repairs may be made in Jacksonville, Fla., or Charleston, S. C.

Aviation fields.—There are 12 aviation fields capable of accommodating and servicing all types of aircraft in Miami and the immediate vicinity. For their names and descriptions attention is called to United States Department of Commerce Airway Bulletin No. 2, "Descriptions of Airports and Landing Fields in the United States."

Tides.—The mean rise and fall of tides at Miami is about 1½ feet (0.4 m) and at Miami Beach about 2½ feet (0.8 m). High and low waters at Miami occur about 2 hours later than at Mayport, but at Miami Beach they occur about the same time as at Mayport.

Currents.—There are strong tidal currents in the Main Channel entrance, the average strength of current being about 2 knots. Daily predictions of the times of slack water and the times and velocities of strength of flood and ebb for Miami Harbor entrance are to be included in the Atlantic Coast Current Tables, beginning with the edition for the year 1936. A strong north wind causes considerable southerly current across the ends of the jetties. Between the entrance cut and the Meteor Wharves the current sets north with the flood and south with the ebb. Sailing vessels entering the harbor usually employ 2 tugboats.

DIRECTIONS, MIAMI HARBOR

Approaches to main channel—*From northward.*—From a position 1½ miles east of Hillsboro Inlet Lighthouse make good a 183° true (S. ⅛ W. mag.) course for 29.5 miles to a position close to *Miami lighted whistle buoy 2* (Fl. R.). Then head into the dredged channel, passing close to lighted bell buoy 2A.

It is reported that a private aeronautical light (flashing white every 10 seconds) located about 9 miles northwestward from Miami has been seen at a distance of 17 miles to seaward. This should not be mistaken for a navigational light.

From southward.—From a position 2 miles east of Fowey Rocks Lighthouse make good a 353° true (N. ¾ W. mag.) course for 10.6 miles to a position close to *Miami lighted whistle buoy 2.*

From seaward.—Steer to a position close to *Miami lighted whistle buoy 2.*

From Hawk Channel.—Practically all boats from this channel are able to enter Miami Harbor via Biscayne Channel. (See below.) If desired to enter through the main channel, follow the directions for Hawk Channel, northbound, until *Miami lighted whistle buoy 2* bears 70° true. Then head in on the entrance range.

Approaches to Biscayne Channel—*From northward.*—Use the main channel instead of Biscayne Channel.

From southward, via Hawk Channel.—Follow the courses for Hawk Channel until about 2.4 miles (N. ½ E.) from Soldier Key

Beacon No. 2. This position is on Biscayne Channel entrance range, range.

From seaward.—Come to a position on Biscayne Channel entrance range, about 1 mile east-southeast from Cape Florida Shoal Light (Fl. R.).

Intracoastal Waterway.—See directions in the **Inside Route Pilot, New York to Key West.**

Courses and distances, Main channel—Sea to Miami

[Abbreviation: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
1. **Miami Lighted Whistle Buoy No. 2** (Fl. R.), bearing ENE. ⅛ E., dist. 100 yards. Steer Miami Entrance Range ahead (front light . W.; rear light Occ. R.; both daymarks white square and tank house with black black vertical stripe, on piles):			
Direct	250	WSW. ⅛ W	1.75
Reverse	*70*	*ENE. ⅛ E*	*1.75*
2. **Outer Cut Lighted Bell Buoy No. 4** (Fl. R.) bearing N., dist. 100 yards. Steer various courses to 75 yards southward of Outer Cut Lighted Buoy No. 6:			
Direct		Various	.3
Reverse		*Various*	*.3*
3. **Outer Cut Lighted Buoy No. 6** (Fl. R.), bearing N., dist. 75 yards. Pass midway between buoys marking dredged cut between jetties:			
Direct	295	NW. by W. ⅞ W	1.1
Reverse	*115*	*SE. by E. ⅞ E*	*1.1*
4. **Meloy Channel Range Front Beacon** (white diamond daymark on pile), bearing SSE. ⅞ E., dist. 250 yards. Pass about 30 to 40 yards north of the lights on the south side of the channel. Vessels are advised to favor the south side of the channel during southerly winds, as a pronounced northerly set of current may then be experienced.			
NOTE.—Directions for Meloy Channel and Fishers Island Channel are given below (courses 4A and 4B):			
Direct	295	NW. by W. ⅞ W	2.8
Reverse	*115*	*SE. by E. ⅞ E*	*2.8*
TO MIAMI BEACH WHARVES			
4A. **Meloy Channel Range Front Beacon**, bearing SSE. ⅞ E., dist. 250 yards. Steer Meloy Channel Range astern (front daymark white diamond on pile; rear daymark, white circular, on pile dolphin). Pass west of Meloy Channel Buoy 2M and east of the black buoys marking the west side of the channel.			
Direct	328½	NNW. ⅞ W	.5
Reverse	*148½*	*SSE. ⅞ E*	*.5*

Courses and distances, Main channel—Sea to Miami—Continued

[Abbreviation: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
TO FISHERS ISLAND WHARVES			
4B. **Meloy Channel Range Front Beacon,** bearing SSE. ⅞ E., dist. 250 yards.	°	*Points*	*Nautical miles*
Direct	268	W. ⅜ S	0. 5
Reverse	*88*	*E. ⅜ N*	*. 5*
5. **Midway between Miami Channel Lights No. 20 and 21 at entrance to turning basin.** Continue on course for about 200 yards, then cross the turning basin and enter the slips of the Municipal Terminal. Or, if bound to the railroad wharf, follow close eastward along the municipal piers and, when the railroad wharf opens up, bearing southwest, head in between Light No. 27 and Beacon No. 26. Or, if bound to the City Yacht Basin, continue south from the municipal piers being guided by the lights and beacons through the channel.			

Courses and distances Biscayne Channel—Hawk Channel to Miami

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. **Soldier Key Beacon No. 2,** bearing S. ½ W., dist. 2.4 miles. Steer Biscayne Channel Entrance Range ahead (front light Fl. R.; rear light Occ. W.). Pass south of Cape Florida Shoal Light No. 2 and Biscayne Channel beacon 4.	°	*Points*	*Nautical miles*
Direct	289	WNW. ½ W	1. 1
Reverse	*109*	*ESE. ½ E*	*1. 1*
2. **Cape Florida Shoal Light No. 2,** bearing ESE. ⅞ E., dist. 900 yards. Steer Biscayne Channel Inner range ahead (front light Fl. R.; rear light Occ. W.). Pass 250 yards west of Biscayne Channel Beacon No. 6.			
Direct	326½	NW. ⅞ N	. 9
Reverse	*146½*	*SE. ⅞ S*	*. 9*
3. **Biscayne Channel Inner Range Front Light No. 8** (Fl. R.), bearing NW. ⅞ N., dist. 100 yards. Head for Biscayne Channel entrance range front light No. 20 (Fl. R.), pass close north of beacon No. 1, close south of beacons No. 10 and No. 18, and about 100 yards south of beacons No. 12, No. 14, and No. 16:			
Direct	270½	W. ⅛ S	1. 6
Reverse	*90½*	*E. ⅛ N*	*1. 6*

Courses and distances Biscayne Channel—Hack Channel to Miami—Continued

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
4. **Biscayne Channel Entrance Range Front Light No. 20** (Fl. R.), bearing W., dist. 150 yards. Pass 100 yards north of light No. 20 and beacon No. 3:			
Direct	289	WNW. ½ W	0.8
Reverse	*109*	*ESE. ½ E*	*.8*
5. **Biscayne Channel Entrance Range Rear Light No. 5** (Occ. W.), bearing S., dist. 100 yards. Pass about 700 yards west of beacons No. 24, No. 26; 500 yards west of beacon No. 28; 200 yards west of Miami South Channel Entrance Range Rear Light (Occ. W.) and 100 yards west of Miami South Channel Entrance Range Front Light (Fl. W.):			
Direct	5	N. ¼ E	5.1
Reverse	*185*	*S. ¼ W*	*5.1*
6. **Miami South Channel Light No. 2** (Fl. R.), bearing E., dist. 50 yards. Steer Miami South Channel Entrance Range astern (front light Fl. W.; rear light Occ. W.). Pass close west of beacon No. 4, east of beacon No. 1, west of Miami South Channel Light No. 6 (Fl. R.), west of beacon No. 8, and east of Biscayne Bay Middle Range Front Light No. 1:			
Direct	0	N. ⅛ W	1.2
Reverse	*180*	*S. ⅛ E*	*1.2*
IF BOUND FOR MIAMI RIVER			
6A. **Miami River Front Range Light No. 10,** bearing SSE. ¼ E., dist. 100 yards. Steer Miami River Range astern (front light Fl. R.; rear light Occ. W., visible from 112° to 202°). Pass between Miami river beacons No. 3 and No. 2:			
Direct	336½	NNW. ¼ W	.5
Reverse	*156½*	*SSE. ¼ E*	*.5*
6B. **Brickell Point,** bearing SW., dist. 50 yards. From Brickell Point steer mid-channel courses in Miami River:			
Direct		Various	
Reverse		*Various*	
IF BOUND FOR THE CITY YACHT BASIN FROM POSITION NO. 6A. ABOVE			
7. **Miami River Range Front Light No. 10,** bearing SSE. ¼ E., dist. 100 yards. Steer Biscayne Bay Middle Range astern (front light Fl. W., rear light Occ. W.; visible from 149° to 239°). Pass 100 yards east of beacon No. 2, and 50 yards west of beacon No. 12:			
Direct	14	N. by E. ⅛ E	.6
Reverse	*194*	*S. by W. ⅛ W*	*.6*

Courses and distances Biscayne Channel—Hawk Channel to Miami—Continued

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
8. **Yacht Basin Front Range Light No. 14** (Fl. R.) bearing SSE. ½ E., dist. 75 yards. Steer yacht basin range astern (front light Fl. R.; rear light Occ. W., visible from 109° to 199°). Pass 50 yards northeast of beacons No. 5 and No. 1:	°	*Points*	*Nautical miles*
Direct	334	NNW. ½ W	0.3
Reverse	*154*	*SSE. ½ E*	*.3*
9. **City Yacht Basin** or **Royal Palm Yacht Basin.** Follow along the city park water front 100 yards off. Note that the eastern limit of a turning basin off the park is marked by beacons A, B, C, and D:			
Direct	------	Various	------
Reverse	------	*Various*	------

15. MIAMI TO KEY WEST

FLORIDA KEYS AND REEFS

(Charts 583, 1248, 1249, 1250, 1251)

The Florida Keys consist of a remarkable chain of low islands, beginning with Virginia Key, in about latitude 25°45′ N., longitude 80°09′ W., and extending in a circular sweep to Marquesas Keys, in latitude 24°33′ N., longitude 82°10′ W., a distance of nearly 145 miles. For a distance of nearly 100 miles they skirt the southeast coast of the Florida Peninsula, from which they are separated by shallow bodies of water known as Key Biscayne Bay, Card Sound, Barnes Sound, and Florida Bay, which are connected in the order named. Biscayne Bay has a depth of 9 to 10 feet (2.7 to 3.0 m) for a great part of its length; the other bodies of water are shallow, full of small keys and shoals, and of no commercial importance excepting as a cruising ground for small boats. Westward of Florida Bay the Florida Keys separate the Straits of Florida from the Gulf of Mexico.

No detailed description of the keys can be given and none is necessary. They are mostly of coral formation, all are low and for the most part covered with a dense growth of mangroves, though some are well wooded with pine, and on a few are groves of coconut trees. Pineapples are being largely cultivated on the keys. Nearly all of the keys along the Hawk Channel are inhabited, but the only place of importance is Key West.

The **Intracoastal Waterway** between Miami and Key West northward of the keys passes southward through Biscayne Bay, Card, Barnes, and Blackwater Sounds and connecting waterways to Florida Bay and Bahia Honda Harbor. From thence it is necessary to

pass either through Hawk Channel or by way of the Gulf of Mexico. The Intracoastal Waterway route is through smooth waters and is well suited to small craft. Strangers should not attempt to carry a greater draft than 4 feet (1.2 m) by this passage.

A passage suitable for very shallow draft boats only has recently been marked by beacons from a point in Big Spanish Key Channel just south of Porpoise Key to Key West. It takes a circuitous route behind the reefs and keys and approaches Key West from the northeastward. This route should not be attempted except with local knowledge. There is a controlling depth of 2 feet (0.6 m) according to surveys in 1935.

A railroad extended across the keys to Key West. The openings under the viaduct and bridges are indicated on the charts. There are two drawbridges, at **Jewfish Key** and **Moser Channel**, through which a depth of 5 to 7 feet (1.5 to 2.1 m) can be taken from Hawk Channel to Florida Bay and the Gulf of Mexico. The bridge across Moser Channel has to 106-foot opening. A strong current, sometimes reaching a velocity of about 4 knots at strength, may be experienced near the bridge. These channels are only used by small craft which trade among the keys and should not be attempted by a stranger without a pilot. The route along the north side of the keys from Miami to Bahia Honda is described in the **Inside Route Pilot, New York to Key West.** This route is crossed by the railroad at Jewfish Creek. There is a drawbridge at that point.

Sections of a **State highway** have been completed from the mainland across the keys to Key West. Vehicle ferries are in operation between the various sections, from **Lower Matecumbe Key** to **Grassy Key** and from the western end of **Key Vaca** to **No Name Key.** A drawbridge is located at Barnes Point, on **Key Largo**, where the highway crosses from the mainland. Other waterways are crossed by trestles which, in some instances, are reported to be of less clearance than the railroad bridges.

The currents have a velocity of 3 to 4 knots through the openings between the keys. See also page 52.

Florida Reefs.—The Florida Keys are skirted on the side next to the straits throughout their whole extent by the Florida Reefs, a chain of dangerous reefs and shoals lying at an average distance of about 5 miles from the line of keys. Between the chain of reefs and keys there is a passage called **Hawk Channel.** The reefs are more dangerous from the fact that they are not marked by breakers in smooth weather and few show above water. On the outer edge of and between the reefs the water shoals abruptly.

In approaching the reefs from seaward, warning of their proximity will usually be given by a difference in the color of the water, which will change from deep blue to light green. Too much dependence must not, however, be placed upon this warning. In clear weather the lighthouses and beacons make navigation along the reefs easy; in thick weather the lead must be relied upon for safety. Soundings in 50 fathoms (91 m) will assure the navigator of being within about 2 to 3 miles of the reefs, and great caution should be used in approaching them closer. Fogs, however, are not frequent in this locality.

Fowey Rocks Lighthouse, lat. 25°35′ N., long. 80°06′ W., is a brown, octagonal, pyramidal, skeleton tower on pile foundation, inclosing a

white dwelling and stair cylinder. The light is group flashing white every 10 seconds (flash 2 seconds, eclipse 1.5 seconds; flash 2 seconds, eclipse 4.5 seconds) with three red sectors, 110 feet (33 m) above the water, and visible 16 miles. A *radiobeacon* has been installed at the light. Hurricane warning flags are displayed, daytime only. Storm and small-craft warnings are not displayed.

Pacific Reef Lighthouse, lat. 25°22′ N., long. 80°08′ W., is a white, square, pyramidal, skeleton structure. The light is a flashing white every 3 seconds, 45 feet (13.7 m) above the water, and visible 12 miles.

Carysfort Reef Lighthouse, lat. 25°13′ N., long. 80°13′ W., is a brown, octagonal, pyramidal skeleton structure on pile foundation, inclosing a conical dwelling and stair cylinder. The light is group flashing white every 20 seconds (3 flashes 0.7 seconds each; 2 eclipses 4.3 seconds each; 1 eclipse 9.3 seconds) with three red sectors, 100 feet (30 m) above the water, and visible 16 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

Fowey Rocks Lighthouse.

Molasses Reef Light, lat. 25°01′ N., long. 80°22′ W., is a brown, square, pyramidal, skeleton structure. The light is flashing white every 5 seconds, 45 feet (13.7 m) above the water, and visible 12 miles.

Alligator Reef Lighthouse, lat. 24°51′ N., long. 80°37′ W., is a white, octagonal, pyramidal, skeleton tower on black pile foundation, inclosing a white dwelling and a stair cylinder. The light is group flashing white (4 flashes of 1 second each, 3 eclipses of 4 seconds each, and 1 eclipse of 24 seconds), with two red sectors, 136 feet (41 m) above the water, and visible 18 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

Tennessee Reef Light, lat 24°44′45″ N., long. 80°46′58″ W.—The structure is a black tank house on a hexagonal, pyramidal, skeleton

tower. The light is flashing white every 3 seconds, 49 feet (14.9 m) above the water.

Very shoal appearing water was reported as existing 2 miles westward of Tennessee Reef Light.

Sombrero Key Lighthouse, lat. 24°38′ N., long. 81°07′ W., is a brown, octagonal, pyramidal, skeleton tower on pile foundation, inclosing a square dwelling and stair cylinder. The light is group flashing white every 15 seconds (5 flashes 1.4 seconds each; 4 eclipses 1 second each; 1 eclipse 4 seconds), with three red sectors, 142 feet (43 m) above the water, visible 18 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

American Shoal Lighthouse, lat. 24°32′ N., long. 81°31′ W., is a brown, octagonal, pyramidal, skeleton tower on pile foundation, in-

Alligator Reef Lighthouse.

closing dwelling and white stair cylinder. The light is flashing white (flash 1.2 seconds, eclipse 3.8 seconds) with three red sectors, 109 feet (33 m) above the water, and visible 16 miles. Small-craft, storm, and hurricane flags are displayed, daytime only.

Key West Lighthouse, lat. 24°33′ N., long. 81°48′ W., is a buff, conical tower, green lantern. The light is occulting white (light 6 seconds, eclipse 6 seconds), with three red sectors, 91 feet (27.7 m) above the water, and visible 14 miles.

Sand Key Lighthouse, lat. 24°27′ N., long. 81°53′ W., is a brown, square, pyramidal, skeleton structure on pile foundation, inclosing square dwelling and stair cylinder. The light is group flashing white (flash 0.5 second, eclipse 1.5 seconds, flash 0.5 second, eclipse 7.5 seconds), with four red sectors, 109 feet (33 m) above the water, and visible 16 miles.

Cosgrove Shoal Light, lat. 24 27′27″ N., long. 82 11′10″ W., is a red hexagonal pyramidal skeleton tower on piles. The light is group

flashing white (4 flashes 0.4 second each, 3 eclipses 1.6 seconds each, 1 eclipse 5.6 seconds) 49 feet (14.9 m) above the water and visible 12 miles.

Rebecca Shoal Lighthouse, lat. 24°35′ N., long. 82°35′ W., is a white, square structure on a brown pile foundation. The light is group flashing white (3 flashes 1 second each, 2 eclipses 2 seconds each, 1 eclipse 8 seconds), with a red sector, 66 feet (20.1 m) above the water, and visible 14 miles.

Pulaski Shoal Light, lat. 24°41′26″ N., long. 82°46′28″ W., is a black hexagonal pyramidal skeleton tower on piles. The light is flashing white (flash 0.4 second, eclipse 2.6 seconds), 49 feet (14.9 m) above the water, and visible 12 miles.

Dry Tortugas Lighthouse, lat. 24°38′ N., long. 82°55′ W., is a conical tower, lower half white, upper half black. The light is flashing white (light 1 second, eclipse 19 seconds), 151 feet (46 m) above the water, and visible 18 miles. A radiobeacon has been installed at the lighthouse.

Wrecks and dangers.—The following obstructions have been reported along the Florida Reefs:

A shoal of 6½ feet (2.0 m) is 0.2 mile south of Fowey Rock Lighthouse.

A shoal of 10 feet (3.0 m) is ¾ mile south of Fowey Rock Lighthouse.

A stub of broken iron, covered by 1½ feet (0.4 m) of water, is 3¼ miles 186° true from Fowey Rock Lighthouse. This is the remains of a beacon formerly marking the reef between Star and Ledbury Reefs.

A pile dolphin, broken off below water level, is reported to lie about ¼ mile south-southeast from Bowles Bank beacon 8. This is a danger to fishing boats.

A wreck, awash at low water, is reported on the eastern side of Long Reef, about 2¼ miles from Ajax Reef beacon B.

A wreck, awash at low water, is reported on the eastern edge of Long Reef, about 1¼ miles from Ajax Reef beacon B.

A wreck, with the stem showing above water, is reported on the eastern edge of Ajax Reef, about 0.4 mile north-northeast from Ajax Reef beacon B.

A small sand islet, which bares about 1 foot at high water, has been washed up on the reef about 1⅞ miles north-northeast from Carysfort Reef Lighthouse. This changes in size and shape with every storm and occasionally disappears.

Two wrecks are reported on the eastern side of "The Elbow", about NE ½ E. from beacon D, and distant about 0.4 and 0.7 mile, respectively. Both are reported to be covered at all stages of the tide.

The wreck of a two-masted schooner lies sunk on the Florida Reefs about 6.5 miles 69° from Sombrero Key Lighthouse.

HAWK CHANNEL

The navigable passage inside the Florida Reefs from Cape Florida to Key West, a distance of about 127 miles, is known as "Hawk Channel." It varies in depth from 10 feet to 5¾ fathoms (3.0 to 10.5 m) and is ¼ mile wide at its narrowest part.

Vessels drawing 10 feet (3.0 m), bound southward and westward, may use this channel with great advantage, avoiding entirely the adverse current of the Gulf Stream and finding comparatively smooth water in all winds, except when passing the large openings between the reefs in southerly winds; these openings are principally between Alligator Reef Lighthouse and American Shoal Lighthouse. Steamers, or sailing vessels with a leading wind, may run the courses through this channel without difficulty. Sailing vessels drawing more than 7 feet (2.1 m) are advised not to try to beat through without a pilot.

Dangers.—A shoal of 8½ feet (2.6 m) is ⅝ mile 345° true from Ragged Key Beacon No. 5, eastward of Ragged Keys.

A shoal of 9 feet (2.7 m) is about 300 yards west of Bache Shoal Beacon 9BS, eastward of the northern part of Elliot Key.

A stub of an old piling with 3½ feet (1.0 m) of water over it lies 175 yards northwest of Pacific Reef Beacon No. 5.

Eastward of Key Largo, 17 yards westward of Basin Hill Beacon 31BH, is a cluster of three broken iron stubs with 3 feet (0.9 m) of water over them.

The wreck of a barge which has grounded and is still intact is located about 6,100 yards 252° true from Carysfort Reef Lighthouse.

A pile is located about 700 yards east of beacon 31 and 8,900 yards 266½° true from Carysfort Reef Lighthouse.

Pilots can generally be found at Miami, or they may be had at Key West and from the small vessels which will sometimes be found cruising among the reefs.

Strangers using this channel must anchor at night, which can be done where the bottom is soft. Where the bottom is hard, the holding ground is bad, and vessels are liable to drag if it blows freshly. Following is a description of the anchorages, given in their order when approaching from northward.

Cape Florida Anchorage is a good anchorage for vessels of about 9-foot (2.7 m) draft, and especially for small craft, just inside Cape Florida. To enter, follow the beacons of the Biscayne Channel (see directions for Biscayne Bay) until about a mile above Cape Florida Shoal Light No. 2, and close to Biscayne Channel Inner Range Front Light No. 8. Pass close to the westward of this light and steer 313° true (NW. ¼ W. mag.). Come to anchor about 300 yards westward of the south end of Cape Florida, with the unused light tower bearing northward of 69° true (ENE. mag.), in a depth of 12 to 20 feet (3.7 to 6.1 m).

Fowey Rocks Anchorage is about 1¼ miles westward of Fowey Rocks Lighthouse, is fairly well sheltered, and can be reached by vessels of about 14-foot (4.3 m) draft. Vessels of this draft may follow the directions for entering Hawk Channel and anchor ¼ mile westward of Fowey Rocks Beacon No. 3V, on the north edge of a red sector of Fowey Rocks Light. Or, from outside pass 2⅜ miles northward of Fowey Rocks Lighthouse and steer 288° true (WNW. ½ W. mag.) for Cape Florida Shoal Light in range with Biscayne Channel Entrance Range Rear Light (Occ. W.) for 1¼ miles. Then steer 184° true (S. 1¼ W. mag.) for 1.4 miles to the anchorage noted above.

Legare Anchorage lies between the reefs westward of Triumph Reef and 7 miles southwestward of Fowey Rocks Lighthouse. The bottom is mostly hard, but there are some soft spots on which vessels may anchor and ride out a moderate gale. The entrances are not marked, and the anchorage is not used.

Bowles Bank Anchorage, with depths of 14 to 16 feet (4.3 to 4.9 m), soft bottom in places, is good in all winds and lies about ½ mile north of Bache Shoal Beacon No. 9 BS., lying eastward of the north end of Elliott Key.

Caesar Creek Bank Anchorage, with depths of 10 to 12 feet (3.0 to 3.7 m), soft bottom, is good in all winds and lies on the west side of the channel between Margot Fish Shoal and Caesar Creek Bank.

An excellent anchorage for small craft will be found in **Caesar Creek,** just north of Caesar Creek Bank. The entrance to the creek is marked by Caesar Creek Light No. 16, and it is reported that there is about 6 feet (1.8 m) on the bar. The channel is marked by private markers. There is also a secure anchorage between Adams, Meigs, and Elliott Keys. About 4 feet (1.2 m) can be carried through a privately marked channel into Biscayne Bay. This channel leads along the northwest side of Adams Key. A light and a stake with a pointer mark a range for passing over the flats to the deeper water in Biscayne Bay.

Key Largo Anchorage.—About ½ mile west of Key Largo Beacon No. 25, off the north end of Key Largo, with Carysfort Reef Lighthouse bearing about 150° true (SSE. ¾ E. mag.), soft bottom in 14 feet (4.2 m) will be found, and vessels may here anchor in safety without regard to the direction of the wind.

Turtle Harbor is a well-sheltered anchorage between the reefs lying northwestward of Carysfort Reef Lighthouse. The entrance from the Straits of Florida is marked by buoys and beacons, and in smooth water a vessel of 15-foot (4.6 m) draft should have no trouble in entering. The depth in the approach ranges from 4 to 6 fathoms (7.3 to 11.0 m) and at the anchorage from 4 to 4½ fathoms (7.3 to 8.2 m). The sea buoy (nun, red, no. 2, "Turtle Harbor") lies 5 miles 30° true (NNE. ½ E. mag.) from Carysfort Reef Lighthouse. From the sea buoy a 274° true (W. ¼ N. mag.) course for 2⅛ miles will lead to *Turtle Harbor Entrance Buoy* (black and white vertical stripes). Then steer 220° true (SW. ⅝ S. mag.) for about 1 mile, pass about 100 yards westward of Ten-Foot Shoal Beacon No. 1 and the same distance eastward of Middle Ground Northeast End Beacon No. 2. A south-southwesterly course will then lead about midway between Middle Ground Southeast Side Beacon No. 4 and Channel Port Side Beacon No. 3, and then steer about 215° true (SW. by S. mag.) to an anchorage in the vicinity of *Turtle Harbor Anchorage Buoy* (black and white vertical stripes).

Garden Cove is a shallow protected anchorage on the east side of Key Largo, at **Key Largo City.** Local knowledge is required to enter this anchorage with over 2½-foot (0.7 m) draft, but the shelter and holding ground, when inside the cove, are reported good. The channel is marked by private finger boards and brush stakes. There is a small landing. Small quantities of provisions can be obtained near here.

Rodriguez Key.—Yachts and small craft can find shelter north of this key in all winds except in the northeast quadrant. Depths are essentially as charted.

Tavernier Key Anchorage.—Anchorage with soft bottom, in 16 to 20 feet (4.9 to 6.1 m), will be found with Tavernier Key bearing between west and northwest, distant about 1 mile, or anchor in 13 to 15 feet (4.0 to 4.6 m) from ½ to ¾ mile westward or northward of Triangles Beacon 39. It is reported that there is an anchorage with a depth of 5 feet (1.5 m) northward of Tavernier Key.

There are two wrecks immediately northward of Tavernier Key; a boiler, awash at high water, lat. 25°00.1′ N., long. 80°29.8′ W., and the wreck of a barge, least depth 1½ feet (0.5 m) at mean low water, lat. 25°00.4′ N., long. 80°30.3′ W.

Teatable Key Channel, formed during the hurricane in September 1935, lies west of Teatable Key and affords passage with a controlling depth of 7 feet (2.1 m) between Hawk Channel and the route north of the keys.

Lower Matecumbe Key.—A ferry slip has been dredged on the southwest point of the key, north of the railroad. The channel to the slip is well marked and has a depth of 6 feet (1.8 m) and over. There is a turning basin at its upper end.

Long Key Anchorage.—Soft bottom, in from 15 to 18 feet (4.5 to 5.5 m), will be found ¾ mile westward of Long Key Beacon 30, but this anchorage is exposed to southerly winds.

Turtle Shoal Anchorage.—Fair anchorage in fine weather will be found in about 4½ fathoms (8.2 m), soft bottom, about 1 mile west of East Turtle Shoal Light 45, and also 1 mile west of West Turtle Shoal Beacon 47, in from 4 to 6 fathoms (7.3 to 11.0 m).

Knights Key Anchorage.—This is a good anchorage about ¾ mile southwestward of Knights Key, but it is exposed to southwesterly winds. To make this anchorage, bring Sombrero Key Lighthouse astern on a 343° true (N. by W. ⅝ W. mag.) course; anchor in 3 to 5 fathoms (5.4 to 9.1 m), sticky bottom. The westerly edge of a red sector in Sombrero Key Lighthouse leads to the anchorage. The west side of Knights Key should be given a berth of about ½ mile.

Hog Key.—An anchorage known locally as **Boot Key Harbor** lies close south of Hog Key. During the construction of the Florida East Coast Railway this was an important base of operations. Large quantities of worn-out and abandoned machinery and barges, etc., mark the location. A narrow channel with a least depth of about 6 feet (1.8 m) has been dredged to Hog Key and affords a secure harbor for launches and small craft. The entrance is about ⅜ mile southward of Knights Key and is marked by private beacons. The color of the banks is the best guide in the narrow channel.

Bahia Honda Harbor is now abandoned as an anchorage for vessels, and the aids are removed. The currents through the bridge have a velocity of 3 to 4 knots. There is head room of 19 feet (5.8 m) under the truss of the railroad viaduct.

No Name Key.—There is a small dock at No Name Key immediately north of the ferry slip. A dredged channel with a reported controlling depth of 8 feet (2.4 m) and marked by private pointer

beacons leads from the deeper waters of Big Spanish Key Channel parallel to the ferry causeway to the turning basin off the dock. Gasoline and some supplies may be obtained.

Newfound Harbor Keys.—There is a good anchorage in the channel close northwest from the Newfound Harbor Keys. There is a fishing camp and dock with a reported depth of 15 feet (4.6 m) at its face in the anchorage. Gasoline and some supplies can be obtained. To enter, head northeast for New Found Harbor Anchorage Beacon 2 on the point of shoal west of the keys. It is reported that the beacon stands in deep water and should be passed close to westward.

Loggerhead Key anchorage, with a depth of 15 feet (4.6 m), soft bottom, is about ¾ mile eastward of Loggerhead Key and about 1 mile north-northeast of Loggerhead Key Beacon No. 34. This is a fair anchorage in all but southerly winds. When going to the anchorage, pass at least ¼ mile eastward of the beacon.

Pirates Cove.—A fishing camp and boat harbor with wharves are located at Pirates Cove, Sugarloaf Key. Gasoline, fresh water, and telephone connection are available. There is a railroad station nearby. It is reached by the channel leading to Sugarloaf Key from Loggerhead Key Beacon No. 34, passing east of Loggerhead Key. It is reported that the best entrance is made by running north from American Shoal and through the channel, partly marked by finger boards, midway between Loggerhead and Sugarloaf Keys. It is reported that there is a depth of 3 feet (0.9 m) in this channel. Local knowledge is absolutely necessary for entrance to Pirates Cove.

Sugarloaf Channel, lying between Sugarloaf and Cudjoe Keys, has been marked by beacons from Hawk Channel on the south to a junction on the north with the passage among the keys between Big Spanish Key Channel and Key West. Sugarloaf Channel is crossed by two bridges with 9-foot (2.7 m) headroom, and is suitable for shallow craft only.

West Washerwoman Anchorage, with a depth of 3¾ fathoms (6.8 m), soft bottom, lies 1⅛ miles 295° true (WNW. mag.) of Nine-Foot Shoal Light.

Saddle Hill Anchorage, with a depth of 4¼ fathoms (7.6 m), soft bottom, lies 1 mile 268° true (W. ⅜ S. mag.) of Pelican Key Beacon 55.

Saddlebunch Harbor and Boca Chica Channel, 10½ and 4½ miles eastward of Key West, were formerly used as hurricane anchorages for small boats, but it is reported that the anchorage areas have been greatly reduced by bridges of the new highway.

DIRECTIONS, HAWK CHANNEL

The following directions are good for a draft of 9 feet (2.7 m) with daylight and moderately smooth sea. A draft of 10 feet (3.0 m) has been taken through Hawk Channel, but it requires local knowledge and a smooth sea.

A detailed description of the dangers in Hawk Channel is impracticable as well as useless. The navigator must rely wholly upon the charts and aids. The beacons and buoys cannot always be distinguished by their color, as they are soon discolored by the sea birds

which alight on them. There are also a number of beacons (spindles with vanes) which are intended for the guidance of vessels skirting along outside the reefs.

The flood current has a northwesterly or northerly set, and the ebb a southerly or southeasterly set. The normal velocity of the currents is about ½ knot, but this may be increased considerably by strong winds. The currents have their greatest velocity abreast of the openings between the keys.

Hawk Channel can be entered from seaward at several points.

Pacific Reef Channel has ample depths for vessels that use Hawk Channel. The entrance is north of the lighthouse, and the channel is marked by beacons. The chart is a sufficient guide.

Turtle Harbor Channel.—The entrance to Turtle Harbor from seaward is described on page 284. Vessels can enter Hawk Channel from this harbor by proceeding a short distance south of the perpendicularly striped buoy in mid harbor and then heading a little north of Turtle Harbor Beacon No. 27 on a 270° true (W. mag.) course.

Molasses Reef Channel has a controlling depth of about 8 feet (2.4 m). The entrance is just south of the light, and the shoalest part of the channel is marked by beacons. The chart is a sufficient guide.

Courses and distances, Hawk Channel, Miami to Key West

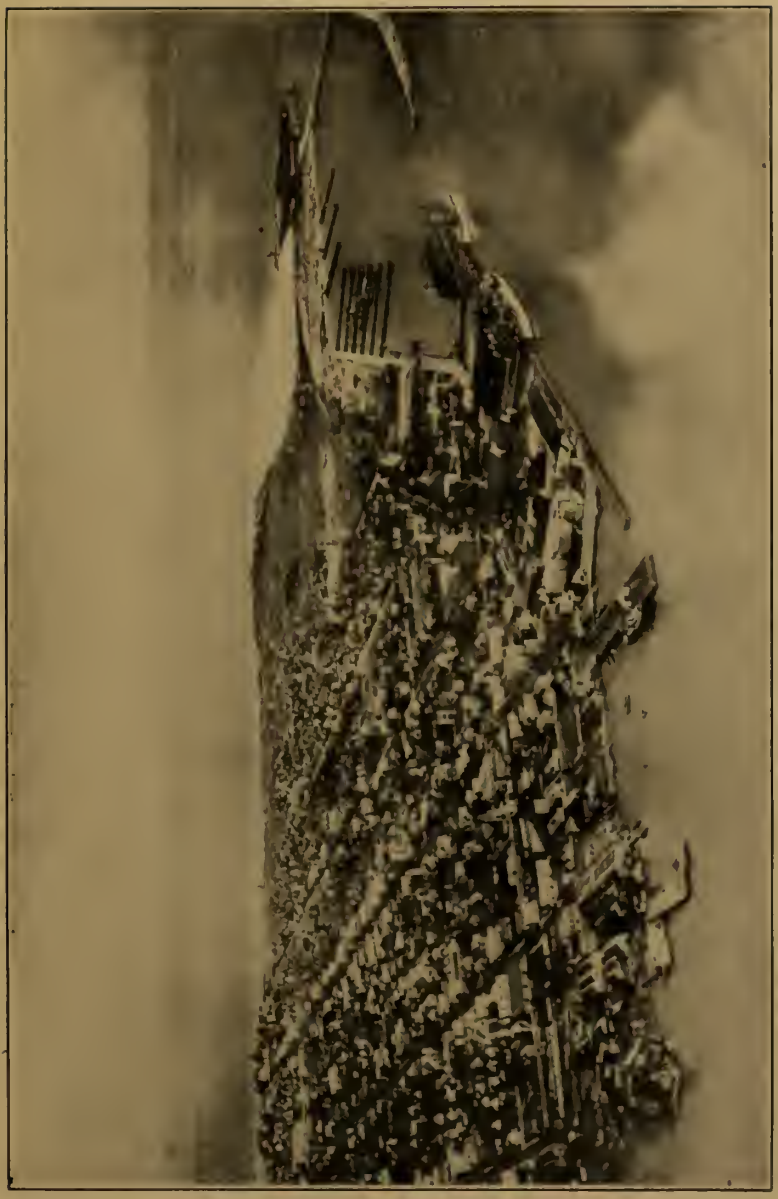
[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. **Miami Lighted Whistle Buoy No. 2.**			
NOTE.—In approaching this position from the north, pass 2¼ miles off Miami Beach:	°	*Points*	*Nautical miles*
Direct	192	S. ⅞ W.	10. 5
Reverse	*12*	*N. ⅞ E.*	*10. 5*
2. **Soldier Key Beacon No. 2,** bearing W., dist. 200 yards:			
Direct	190½	S. ¾ W.	5. 6
Reverse	*10½*	*N. ¾ E.*	*5. 6*
3. **Bowles Bank Beacon No. 8,** bearing W., dist. 50 yards. Pass ¼ mile westward of Bache Shoal Beacon 9BS to avoid a shoal 300 yards west of the beacon:			
Direct	209	SSW. ½ W.	2. 4
Reverse	*29*	*NNE. ½ E.*	*2. 4*
4. **Elliott Key Beacon No. 10,** bearing W., dist. 200 yards:			
Direct	180	S. ⅛ E.	1. 3
Reverse	*0*	*N. ⅛ W.*	*1. 3*
5. **Elliott Key Beacon No. 13,** bearing E., dist. 75 yards:			
Direct	198	S. by W. ⅜ W.	6. 0
Reverse	*18*	*N. by E. ⅜ E.*	*6. 0*
6. **Old Rhodes Key Beacon No. 19,** bearing E., dist. 100 yards:			
Direct	214½	SSW. ⅞ W.	9. 6
Reverse	*34½*	*NNE. ⅞ E.*	*9. 6*

Courses and distances, Hawk Channel, Miami to Key West—Continued

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
	°	*Points*	*Nautical miles*
7. Basin Hill Light No. 31 BH, bearing SE., dist. 300 yards:			
Direct	210½	SSW. ⅝ W	9. 2
Reverse	*30½*	*NNE. ⅝ E*	*9. 2*
8. Mosquito Bank Light No. 35 (Fl. W., red sector), bearing SSW., dist. 1 mile. Pass 650 yards northwest from Mosquito Bank Light No. 35:			
Direct	223½	SW. ¼ S	12. 9
Reverse	*43½*	*NE. ¼ N*	*12. 9*
9. Hen and Chickens Shoal Light No. 24 (Fl. R.) bearing NW., dist. 400 yards:			
Direct	235	SW. ¾ W	4. 0
Reverse	*55*	*NE. ¾ E*	*4. 0*
10. Upper Matecumbe Beacon No. 41, bearing SE., dist. 200 yards:			
Direct	238	SW. by W	12. 0
Reverse	*58*	*NE. by E*	*12. 0*
11. Long Key Beacon No. 30, bearing N., dist. 500 yards:			
Direct	245½	SW. by W. ¾ W	16. 8
Reverse	*65½*	*NE. by E. ¾ E*	*16. 8*
12. East Washerwoman Shoal Light No. 49 (Fl. W.), bearing S., dist. 400 yards:			
Direct	255	WSW. ½ W	5. 3
Reverse	*75*	*ENE. ½ E*	*5. 3*
13. Pigeon Key Bank Buoy (black and white vertical striped can) close aboard. Pass 400 yards north of Bahia Honda Key Buoy and ½ mile north of Newfound Harbor Keys Buoy, and 500 yards north of Nine Foot Shoal Light (Fl. W.):			
Direct	257½	WSW. ⅝ W	34. 6
Reverse	*77½*	*ENE. ⅝ E*	*34. 6*
14. Hawk Channel Turn Buoy (black and white vertical striped can) close aboard to northward:			
Direct	289	WNW. ½ W	2. 1
Reverse	*109*	*ESE. ½ E*	*2. 1*
15. Whitehead Point Spit Lighted Buoy No. 6 (Fl. R.) close aboard to northeastward:			
Direct	4	N. ⅛ E	. 7
Reverse	*184*	*S. ⅛ W*	*. 7*
16. Fort Taylor Shoal Lighted Buoy No. 8 (Fl. R.) close aboard to eastward. Come onto Key West Harbor range ahead (front light Fl. W., red tank house on piles; rear light Occ. W., black tank house on white pyramidal pile structure) bearing 24° true and pass 100 yards off the navy yard docks and thence on range until west of the railroad docks:			
Direct	------	Various	1. 2
Reverse	------	*Various*	*1. 2*
17. Railroad dock.			



Key West, Fla., from northwestward.

KEY WEST HARBOR

(Chart 584)

This harbor is large and commodious and one of the best anchorages for large vessels south of Chesapeake Bay. It lies northward of a broken line of the Florida Reefs in latitude 24°33′ N. and longitude 81°49′30″ W. The harbor proper lies in front of the city of Key West, protected on the eastern side by the island and on the other sides by submerged reefs and sand flats. It has a length of 2 miles and a width of about ¼ mile. Southwest of the harbor proper there is a large anchorage area protected by the reef. The harbor is entered through breaks in the reef, there being five main channels with depths of 13 to 30 feet (4.0 to 9.1 m) and several minor channels. There are no bridges across the ship channels at this port.

Northwest Passage Unused Lighthouse (Old Tower) is a white dwelling on brown pile foundation, standing in 4 feet (1.2 m) of water, at the northwesterly entrance to Northwest Channel. The light is discontinued.

Smith Shoal Lighthouse on Smith Shoal, off the northwest entrance to Northwest Channel, is a black tank house on a white, hexagonal, pyramidal, skeleton tower on piles. The light is flashing white, 47 feet (14.3 m) above the water, and visible 12 miles.

Channels.—There are several channels or approaches to the harbor, leading between the reefs and coral banks which surround it; they have been examined by means of a wire drag, and the dangers are shown on the chart. These channels are easy to follow in a sailing vessel in the daytime with a fair wind, but it is not safe for a stranger to attempt to beat into the harbor. Main Ship Channel and Northwest Channel are principally used and, in conjunction, furnish a direct route across the reef for vessels drawing up to 19 feet (5.8 m).

Southeast Channel is marked by buoys and at night by the easterly edge of a red sector in Key West Light; it leads over lumpy bottom with 14 to 18 feet (4.3 to 5.5 m) over the coral heads, and it is not recommended for vessels of over 13 feet (4.0 m) draft. The course through the channel is 321° true (NW. ⅜ N. mag.) for Key West Lighthouse.

Main Ship Channel has an improved depth of 30 feet (9.1 m) for a width of 300 feet and is well marked by buoys and lights. This channel is used by the deeper-draft vessels and by strangers.

Southwest Channel is convenient for vessels approaching from southwestward; it has a navigable depth of 24 feet (7.3 m) if closely followed and is marked by several buoys. Vessels of 16-foot (4.9 m) draft can make one course nearly to the anchorage by heading for Key West Lighthouse, bearing 55° true (NE. ⅝ E. mag.) in the daytime, and by standing on the edge of a red sector of that light at night, and this is about the deepest draft of the vessels using the channel. Strangers should not attempt it at night.

West Channel is a passage leading westward from Key West between the outer reefs and the keys. The channel is deep and is fairly well marked by buoys and lights. It is used by small boats bound toward the Dry Tortugas.

Northwest Channel has been improved. The jetties on either side at the entrance are from ¼ to ½ mile off the channel, and the outer portion of the east jetty is exposed. In June 1935 the controlling depth was 20.3 feet (6.2 m) for a width of 150 feet. This channel affords a passage from Key West Harbor to the Gulf of Mexico and is well marked. The mean range of the tide at the north entrance is about 2½ feet (0.8 m), and high and low waters occur about two hours later than at Key West.

Calda Channel extends northward from Man-of-War Harbor and forms a passage with a controlling depth of about 7 feet (2.1 m) to the Gulf of Mexico. The channel is narrow but well marked by a light and beacons.

Prominent features.—When standing along about 6 miles southward of the Florida Keys, the Casa Marina Hotel shows prominently about 1 mile east of Whitehead Point. As the entrances from the southward are approached, the city, Key West Lighthouse, and the cupola of the Colonial Hotel will be seen near the western end of Key West Island, and Fort Taylor will show prominently a little westward of the island. The naval radio towers are conspicuous north of the fort, the north tower being distinctively painted. Sand Key Lighthouse will be seen about 7 miles southwestward of Key West Lighthouse.

Sand Key and **Key West Lighthouses** are described on page 281.

Eastern Triangle Light (flashing red), a black tank house on a red, triangular, pyramidal, skeleton structure, on piles, is midway between the entrance buoys of the Main Ship Channel and Key West Lighthouse and can be readily distinguished from outside the reefs.

Anchorage.—The best anchorage is in the inner or Man-of-War Harbor, where the depth is 3½ to 4½ fathoms (6.5 to 8.2 m); this anchorage is northward of the city between coral banks, which prevent a heavy sea. Vessels can anchor anywhere off the city northward of Fort Taylor, or in the entrance to the Northwest Channel abreast of the city in 3½ to 5 fathoms (6.5 to 9.1 m), taking care, however, not to get too close to the reefs, which in some places rise abruptly at the edge of the channels. The outer anchorage, about 1 mile from Fort Taylor, with the fort bearing between 36° true (NE. by N. mag.) and 328° true (NW. by N. mag.), has depths of 4½ to 6 fathoms (8.2 to 11.9 m) and is somewhat exposed but is safe for vessels with good ground tackle.

Small-craft anchorages.—Small craft generally anchor in the cove on the north side of the city southward of the railroad wharf. The former submarine basin is now being used as a public yacht basin and furnishes good berths for small craft. Gasoline can be delivered direct to vessels in the basin.

Pilots.—The pilots no longer cruise outside but can always be had by making signal while outside the reefs or on radio notification. A lookout is kept in either the La Concha Hotel or City Hall towers. The pilots will take vessels in at night. Pilots for Hawk Channel can also be had at Key West.

Special service by pilot boat.—Vessels frequently find it convenient to make use of a special service performed by the pilot boat at Key West. If requested by radio or telegraph from another port, the pilot boat will meet vessels at the bar buoy, main channel, and deliver orders or provisions or take off sick men bound for the marine hos-

pital at Key West. A flat rate of $60, day or night, is charged for this service.

Pilotage is compulsory for foreign vessels and for other vessels except when the master or one of the mates are licensed by the Federal Government. Pilotage is optional for coastwise vessels drawing 6 feet (1.8 m) of water or less. Vessels carrying United States mails pay half pilotage only. The following are extracts from the rules and regulations:

1. The master of any vessel entering the port of Key West who does not accept the services of a pilot shall be compelled to pay the full legal rates of pilotage, provided the vessel be spoken outside the following limits:

If she be entering by main ship channel she must be spoken outside the western head buoy or no. 1. If by Hawk Channel, she must be spoken east of midchannel buoy, intersecting Southeast Channel and Hawk Channel, Key West Light bearing NW. ¼ N.

If entering by Southwest Channel or Sand Key, she shall be spoken southwest of a line of no. 7 black buoy and no. 8 red buoy in Southwest Channel. If entering Northwest Channel, she must be spoken outside of no. 1 or bar buoy. If entering by Southeast Channel, she must be spoken outside of no. 4 red buoy, Sand Key bearing SW. by W. ¾ W.

Should a vessel entering the port of Key West without being spoken by a licensed pilot outside the foregoing limits, the first pilot speaking her thereafter shall be entitled to full outward pilotage.

8. Any pilot detained on board of any vessel by the master or quarantine officer shall receive for each and every day's services the sum of $5 per day over and above his pilotage.

9. All fees and rates of pilotage on vessels entering or leaving this port shall be due 24 hours previous to clearing from customhouse and are recoverable before any justice of the peace or other courts having competent jurisdiction in this county.

Pilotage rates are as follows:

	Per foot
6 feet draft or less	$2
6 to 10 feet draft	3
10 to 14 feet draft	4
14 to 20 feet draft	5
Over 20 feet draft	6

Rates for moving, docking, shifting, or taking from docks are as follows:

14 feet draft or less	$10
Over 14 feet draft	20

Tides.—The mean rise and fall of the tide is about 1¼ feet (0.4 m). Daily predictions of the times and heights of high and low waters will be found in the Tide Tables, Atlantic Ocean.

Currents.—The tidal currents in Key West Harbor and Northwest Channel set fair with the channels, and the times of maximum current at these places are nearly simultaneous, the strength of the flood (north flowing) occurring about 2½ hours before high water, and the ebb about 2 hours before low water, at Key West. Slack water occurs about ½ hour and 2 hours, respectively, after high and low water at Key West. The average velocity at strength of both flood and ebb is about 1 knot between Whitehead Spit and Kingfish Shoals, 1½ knots in Man-of-War Harbor and its entrance, and 1½ knots in Northwest Channel abreast of Middle Ground. These normal conditions are greatly modified by winds.

Winds.—The prevailing winds are easterly, the strongest north in winter and easterly during the hurricane months. See also the meteorological tables in the appendix.

DIRECTIONS, KEY WEST HARBOR

The approaches to Key West Harbor have been examined by means of a wire drag, and the dangers are shown on the chart.

Key West Entrance Lighted Whistle Buoy (Fl. W.) is moored in 91 feet (27.7 m) on the Main Ship Channel range, 5 miles, 176° true, from Key West Main Channel Range Front Light. Main entrance buoys nos. 1 and 2 mark the 24-foot (7.3 m) curves at the sides of the channel, about ¼ mile northward of the entrance buoy.

Key West Main Ship Channel Range marks the axis of the channel up to Eastern Triangle Light. The front light (fixed red) of the range is mounted on a white skeleton structure, solid daymark on the inshore end of the causeway leading to Fort Taylor; the rear light (fixed red) of the range is mounted on a white iron mast near the southeast corner of the Lighthouse Depot Shed, white stripe down roof and side of shed.

Courses and distances, Main Ship Channel

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. **Sand Key Lighthouse,** bearing W., dist. 4.2 miles. Keep to eastward of the entrance buoy to avoid wreck with unknown depth over it which lies to westward of the buoy:	°	*Points*	*Nautical miles*
Direct	356	N. ⅝ W.	0. 6
Reverse	*176*	*S. ⅝ E.*	*. 6*
2. **Key West Entrance Lighted Whistle Buoy** (Fl. W.) close to westward. Steer Key West Main Ship Channel Range ahead (both lights F. R.); front daymark white, on white skeleton structure, rear daymark, white iron mast, white stripe down roof and side of shed:			
Direct	356	N. ⅝ W.	2. 8
Reverse	*176*	*S. ⅝ E.*	*2. 8*
3. **Eastern Triangle Light** (Fl. R., black tank house on red skeleton structure on piles), bearing E. dist. 100 yards. Head for Kingfish Shoal Light (Fl. R., red tank house on triangular, pyramidal skeleton structure on piles), open slightly south of Northwest Channel Inner Range Front Light 13 (Fl. W., white tank house on 5-pile dolphin. Pass 400 yards southwest of buoy 6:			
Direct	335	NNW. ½ W.	2. 0
Reverse	*55*	*SSE. ½ E.*	*2. 0*
4. **Whitehead Spit Lighted Buoy 6** (Fl. R), bearing ESE. ⅛ E., dist. 600 yards. Steer Key West Harbor Range ahead (Front light Fl. W., red tank house on 5-pile dolphin; rear light Occ. W., black tank house on white skeleton structure); pass 150 yards off navy yard wharves:			
Direct	24	N. by E. ⅞ E.	2. 0
Reverse	*204*	*S. by W. ⅞ W.*	*2. 0*
5. **Man-of-War Harbor.**			

Northwest Channel.—Northwest Channel has been examined by means of a wire drag, and the dangers are shown on the chart. The following courses lead in a least depth of about 19 feet (5.8 m):

From a position about 0.3 mile east of Smith Shoal Lighthouse (Fl. W.) steer 171° true (S. by E. ⅛ E. mag.) to a position about 200 yards west of Northwest Channel Entrance Lighted Bell Buoy No. 1 (Fl. W.).

Then be guided by the directions in the following table.

Courses and distances, Northwest Channel

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; Lt., light; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
1. **Northwest Channel Entrance Lighted Bell buoy 1** (Fl. W.) bearing E., dist. 200 yards. Head for Northwest Bar Front Lt. (Fl. R., red triangular house on piles) in range with Northwest Channel Entrance Rear Lt. (Occ. W., black tank house on white, triangular, pyramidal, slatted structure on piles):	°	*Points*	*Nautical Miles*
Direct	171	S. by E. ⅛ E	0.8
Reverse	*351*	*N. by W. ⅛ W*	*.8*
2. **Northwest Channel Buoy No. 3,** bearing E., dist. 150 yards. Haul gradually to eastward, passing between Northwest Bar Front Lt. and Channel Lighted Buoy No. 5:			
Direct	------	Various	.4
Reverse	------	*Various*	*.4*
3. **Northwest Channel Buoy No. 7,** bearing E., dist. 150 yards. Bring Northwest Bar Front Lt. (Fl. R., red triangular house on piles) and Northwest Channel Turn Rear Lt. (Occ. W., black tank house on white, triangular, pyramidal, skeleton structure on piles) on range astern. Pass 75 yards southwest of buoys No. 7A and No. 9 and 100 yards northwest of buoy No. 6, and steering Northwest Channel Turn Easterly Range ahead (front light Fl. W., white lantern box and pointer on 5-pile dolphin; rear light Occ. W., black tank house on white skeleton structure on piles):			
Direct	118	SE. by E. ¾ E	.9
Reverse	*298*	*NW. by W. ¾ W*	*.9*
4. **Northwest Channel Buoy No. 6,** bearing W., dist. 225 yards. Steer Northwest Channel Inner Range ahead (front light Fl. W., white tank house on 5-pile dolphin; rear light Occ. W., black tank house and white square, daymark on white, triangular, pyramidal, skeleton structure on piles). Pass northeast of Channel lighted buoy No. 6A (Fl. R.), southwestward of buoys No. 11, No. 11A, and No. 11B, and northeastward of buoy No. 8:			
Direct	139	SE. ⅛ S	2.9
Reverse	*319*	*NW. ⅛ N*	*2.9*

Courses and distances, Northwest Channel—Continued

[Abbreviations: F., fixed; Fl., flashing; Occ., occulting; W., white; R., red; Lt., light; dist., distant]

(For reverse direction read upward and interchange ahead and astern)	Course (reverse course in *italics*)		Distance
	True	Magnetic	
5. **Northwest Channel Inner Range Front Light No. 13,** bearing SE. ⅛ S., dist. ¼ mile. Deep-draft vessels favor Northwest Channel Buoy No. 10:	°	*Points*	*Nautical miles*
Direct	157	SSE. ¼ E	0. 8
Reverse	*337*	*NNW. ¼ W*	*. 8*
6. **Channel Lighted Buoy No. 15** (Fl. W.), bearing E., dist. 150 yards. NOTE.—Vessels drawing 14 feet (4.3 m) or less can cross the middle ground by passing about 400 feet south of Northwest Channel Inner Range Rear Lt. (Occ. W.). This light on range with Key West Lighthouse (Occ. W.) clears the 11 foot (3.4 m) spot on the south side of the middle ground:			
Direct	148	SE. ⅞ S	1. 1
Reverse	*328*	*NW. ⅞ N*	*1. 1*
7. **Kingfish Shoal Light** (Fl. R.), bearing W., dist. 125 yards. Continue on course until in edge of red sector of or Key West Lighthouse bears 69° true:			
Direct	167½	S. by E. ⅜ E	. 9
Reverse	*347½*	*N. by W. ⅜ W*	*. 9*
8. **Edge of red sector, Key West Lighthouse,** bearing 69° true. Head for the lighthouse until Key West Harbor Range comes on:			
Direct	69	NE. by E. ⅞ E	. 4
Reverse	*249*	*SW. by W. ⅞ W*	*. 4*
9. **Key West Harbor Range.** Steer Key West Harbor Range ahead (front light Fl. W., red tank house on 5-pile dolphin; rear light Occ. W., black tank house on white skeleton structure); pass 150 yards off navy-yard wharves:			
Direct	24	N. by E. ⅞ E	1. 5
Reverse	*204*	*S. by W. ⅞ W*	*1. 5*
10. **Man-of-War Harbor.**			

KEY WEST

Key West, on Key West Island, near the western end of the Florida Keys, is the only city of any size on the west and north shores of the Straits of Florida. It is the terminus of the Florida East Coast Railroad, and has steamship communication with New York, Habana, Tampa, New Orleans, and Galveston. A number of steamers and small sailing vessels enter and clear from this port, over half of which are from or for foreign ports.

The city was once of considerable commercial importance but this has fallen off in late years. It is now rapidly becoming a winter-resort city. The commerce consists of canned goods, fish, fruits, crude and refined oils, and general merchandise. The greatest draft

of vessels coming to the port is 26½ feet (8.1 m) and the average draft is 14 feet (4.3 m).

One hotel is open throughout the year and several during the winter season only.

Harbor regulations.—The harbormaster has direct supervision of the port. He has charge of anchoring and mooring all vessels and collects all port dues.

Quarantine.—Vessels subject to inspection by the quarantine officer are boarded off Fort Taylor; and no vessel is permitted to pass above this point before obtaining practique. The quarantine anchorage is in Man-of-War Harbor northward of Fleming Key.

Terminal facilities.—The depth at the piers and wharves ranges from 10 to 26 feet (3.0 to 7.9 m), according to the locality. The five railroad piers are used for general freight and passengers, transferring and storage of oils, and the handling of cars for the ocean ferry to Habana. Three other privately owned facilities are used for general freight and have a berthing space of about 2,000 feet. In addition there are three Government-owned piers with a berthing space of about 2,000 feet. There are facilities for the storage of oils and general cargo and three piers have transfer sheds.

There is a 15-foot (4.6 m) spot about 10 feet off the middle of the outer face of the lighthouse wharf. There is a depth of 13½ feet (4.1 m) at the middle of the outer face.

Supplies.—There are excellent facilities for securing fuel oil, gasoline, etc. Only a small quantity of coal is available. Key West has no local source of fresh water other than rain water, a considerable quantity of which is available from storage and is supplied to vessels through pipe lines. Well water is also supplied by the railroad; it is soft and good for boiler purposes. The usual charge for water is $10 per 1,000 gallons. Provisions of various kinds and some ship chandlery are available.

Being less than an hour's run off the main route for ships passing about the south end of Florida, Key West is a covenient place of call for fuel and provisions. Arrangements can be made locally for the delivery of supplies and provisions to vessels in the Gulf Stream.

Repairs.—There is a small marine railway, 160 feet long, with a lifting capacity of about 1,000 tons. Vessels of 8 feet (2.4 m) draft forward and 16 feet (4.9 m) aft can be hauled out. Repairs to the hulls of wooden vessels can be made, and there is a machine shop where ordinary repairs can be made. Boiler and blacksmith work can be done, but there is no foundry.

There are also marine ways for smaller craft capable of handling boats up to 70 feet in length and 6 feet (1.8 m) draft. Ordinary repairs to small craft can be made.

Towboats.—Key West is the regular station for a large salvage tug, and several smaller tugs are also available. General equipment as needed for heavy salvage work is available.

Communications.—The Florida East Coast Railway formerly connected with Miami and points north. There was car ferry service to Habana.

The Overseas Highway connects with Miami with two ferries along the route.

There is telephone and telegraph connection and a radiotelephone and telegraph station (NAR) controlled by the United States Navy, but available for general public service.

There is seasonal air service to Miami.

Aviation fields.—Meacham Airport, commercial, is located 2½ miles east of the city. There is one surfaced runway, 2,000 feet, east and west; one landing strip, 1,600 feet, east and west. There are daytime facilities for servicing aircraft.

The **Navy Seaplane Anchorage** is west of Key West, inside the breakwater adjacent to the submarine base. There are no servicing facilities, and the ramp at the south end of the submarine basin is for Government use only except in emergency or by permission.

Storm warnings are displayed at the Weather Bureau signal mast at the navy yard. Small craft warnings are displayed on the buildings of the William Curry Sons Company and Lumley-Roberts Hardware Company.

United States Public Health Service.—A United States Marine Hospital is located at Key West. There are also two smaller privately owned hospitals.

APPENDIX

COAST PILOTS OF THE COAST AND GEODETIC SURVEY

	Price
U. S. Coast Pilot, Atlantic Coast, Section A, from St. Croix River to Cape Cod	$0.75
U. S. Coast Pilot, Atlantic Coast, Section B, from Cape Cod to Sandy Hook, including Long Island Sound	.75
U. S. Coast Pilot, Atlantic Coast, Section C, Sandy Hook to Cape Henry, including Delaware and Chesapeake Bays	.75
U. S. Coast Pilot, Atlantic Coast, Section D, Cape Henry to Key West	.75
U. S. Coast Pilot, Gulf Coast, from Key West to the Rio Grande	.75
U. S. Coast Pilot, West Indies, Puerto Rico, and Virgin Islands	.75
Inside Route Pilot, New York to Key West	.50
U. S. Coast Pilot, Pacific Coast, California, Oregon, and Washington	.75
U. S. Coast Pilot, Alaska, Part I, from Dixon Entrance to Yakutat Bay	.75
U. S. Coast Pilot, Alaska, Part II, Yakutat Bay to Arctic Ocean	.75
U. S. Coast Pilot, Hawaiian Islands	.50
U. S. Coast Pilot, Philippine Islands, Part I, Luzon, Mindoro, and Visayas	.75
U. S. Coast Pilot, Philippine Islands, Part II, Palawan, Mindanao, and Sulu Archipelago	.75
Distances Between United States Ports	.10

FIELD STATIONS

Boston, Mass., room 808, Customhouse.
New York, N. Y., rooms 741–742 Customhouse.
New Orleans, La., room 314, Customhouse.
San Francisco, Calif., room 510, Customhouse.
Seattle, Wash., room 601, Federal Office Building.
Manila, P. I., Intendencia Building.

At these stations complete files of the United States Coast and Geodetic Survey Charts, Coast Pilots, Tide Tablets, Current Tables, and other publications relating to navigation may be consulted and information affecting navigation obtained without charge. Light Lists, Buoy Lists, and Notices to Mariners are kept for sale or for free distribution to mariners. The field stations are also sales agencies for the Coast and Geodetic Survey publications. A chart catalogue, giving lists of Charts, Coast Pilots, Tide Tables, and agencies of the Coast and Geodetic Survey, can be obtained from any of the field stations or will be sent, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C. Frequent changes occur in the agencies, and the list of agencies is published in the first notice each month of the Notice to Mariners.

NAVIGATIONAL AIDS AND THE USE OF CHARTS

The **Coast and Geodetic Survey** is charged with the survey of the coasts, harbors, and tidal estuaries of the United States and its insular possessions and issues the following publications relating to these waters as guides to navigation: Charts, Coast Pilots, Tide Tables, Current Tables, a catalog of these publications, and Notices to Mariners, the last-named published weekly by the Bureau of Lighthouses and Coast and Geodetic Survey.

Charts bear three dates, which should be understood by persons using them: (1) The date (month and year) of the edition, *printed* on the late charts below

the border in a central position; (2) the date of the latest correction to the chart plates, *printed* in the lower left-hand corner below the border; (3) the date of issue, *stamped below* the border and just to the left of the subtitle. Charts show all necessary corrections as to lights, beacons, buoys, and dangers, which have been received to the *date of issue*, being hand corrected since the latest date printed in the lower left-hand corner. All small but important corrections occurring subsequent to the *date of issue* of the chart are published in Notices to Mariners and should be applied by hand to the chart immediately after the receipt of the notices. The date of the edition of the chart remains unchanged until an extensive correction is made on the plate from which the chart is printed. The date is then changed and the issue is known as a new edition. When a correction, not of sufficient importance to require a new edition, is made to a chart plate, the year, month, and day are noted in the lower left-hand corner. All the notes on a chart should be read carefully, as in some cases they relate to the aids to navigation or to dangers that cannot be clearly charted. The charts are various in character, according to the objects which they are designed to subserve. The most important distinctions are the following:

1. Sailing charts, mostly on a scale of approximately 1:1,200,000, which exhibit the approaches to a large extent of coast, give the offshore soundings, and enable the navigator to identify his position as he approaches from the open sea.

2. General charts of the coast, on scales of 1:400,000 and 1:200,000, intended especially for coastwise navigation.

3. Coast charts, on a scale of 1:80,000, by means of which the navigator is enabled to avail himself of the channels for entering the larger bays and harbors.

4. Harbor charts, on larger scales, intended to meet the needs of local navigation.

Note.—General charts of the Philippine Islands are on scales 1:1,600,000, 1:800,000, and 1:400,000; coast charts are on scales 1:100,000 and 1:200,000.

Coast pilots, relating to waters of the United States, Puerto Rico, Virgin Islands, Alaska, Hawaiian Islands, and the Philippine Islands, contain descriptions of the coasts, harbors, dangers, and directions for coasting and entering harbors. At intervals of about one year supplements are issued, containing the more important corrections since the publication of the volume. The supplements are printed on one side of the paper only, so that they may be cut and pasted in the appropriate places in the volume. Supplements and other corrections for any volume can be furnished, free of charge, on application to the Coast and Geodetic Survey, Washington, D. C., or any of its field stations, provided the volume itself has not been superseded by a subsequent edition.

Tide tables.—The Coast and Geodetic Survey Tide Tables are issued annually in advance of the year for which they are made and contain the predicted times and heights of the tide for each day in the year at the principal ports of the world. A table of tidal differences is given by means of which the tides at about 3,900 intermediate ports may be obtained. These tables are published in two volumes under the titles: Tide Tables, Atlantic Ocean, and Tide Tables, Pacific Ocean and Indian Ocean.

Current tables are also issued annually in advance. They include daily predictions of the times of slack water and the times and velocities of strength of flood and ebb for a number of harbors, together with differences for obtaining predictions for numerous other places, as well as other useful information on currents. The current tables appear in two volumes, one for the Atlantic coast of the United States and the other for the Pacific coast of the United States.

Agencies for the sale of the Charts, Coast Pilots, Tide Tables, and Current Tables of the Coast and Geodetic Survey are established in many ports of the United States and in some foreign ports. The charts and publications can also be purchased in the office of the Coast and Geodetic Survey, Washington, D. C., or any of the field stations. If ordered by mail, prepayment is obligatory. Remittances should be made by postal money order or express order, payable to the Coast and Geodetic Survey. Postage stamps, checks, and drafts cannot be accepted. The sending of money in an unregistered letter is unsafe. Only catalogue numbers of charts need be mentioned. The catalogue of charts and other publications of the survey can be obtained free of charge on application at any of the sale agencies or to the Coast and Geodetic Survey, Washington, D. C. A

list of the sales agencies of the Coast and Geodetic Survey is published quarterly in the Notice to Mariners.

Other publications.—Lists of Lights, including buoys and other daymarks of the United States, its insular possessions, and the Great Lakes, are published by the Bureau of Lighthouses and may be purchased from its sales agencies or from the Superintendent of Documents, Washington, D. C. Notice to Mariners, relating to the same waters, is published weekly by the Bureau of Lighthouses and Coast and Geodetic Survey; this publication can be obtained free of charge on application to the superintendents of lighthouses of the various districts. The Corps of Engineers, United States Army, in cooperation with the Bureau of Operations, United States Shipping Board, publish the Port Series in 21 volumes and Port and Terminal Charges at United States Ports. These volumes contain much useful information concerning port conditions which is of interest to the navigator. They may be purchased from the Superintendent of Documents, Washington, D. C.

PUBLICATIONS

The following résumé of the United States Government publications of navigational value is included for the ready reference of the mariner:

The Catalog of United States Coast and Geodetic Survey Nautical Charts, Coast Pilots, Tide Tables, Current Tables, Tidal Current Charts, and Aeronautical Charts is distributed free by the United States Coast and Geodetic Survey and its authorized agents.

The List of Publications of the Department of Commerce lists the publications of the United States Coast and Geodetic Survey and may be secured free on application from the offices of the Department of Commerce and its field agencies, or from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Certain libraries have been designated by the Congress of the United States to receive prints, as issued, of all publications printed by the Government for public distribution. These publications may be consulted by anyone during business hours.

NAUTICAL CHARTS

Coasts of the United States, Territories, and Possessions:
Issued by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

Mississippi River from the Head of Passes to Cairo:
Issued and for sale by the Mississippi River Commission, Vicksburg, Mississippi.

Illinois Waterway System:
Issued and for sale by the United States Engineers, Chicago, Illinois.

Ohio River:
Issued and for sale by the United States Engineers, Cincinnati, Ohio.

Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River, St. Regis to Cornwell, Canada:
Issued and for sale by the United States Lake Survey, Detroit, Michigan.

New York State Canal System:
Issued and for sale by the Superintendent of Public Works, Albany, New York.

Foreign countries:
Issued by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

COAST PILOTS

Coasts of the United States, Territories, and Possessions:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

Foreign countries:
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

TIDE TABLES

Atlantic Ocean, and Pacific and Indian Oceans—Two volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

CURRENT TABLES

Atlantic Coast, North America, and Pacific Coast, North America, and Philippine Islands—Two volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

TIDAL CURRENT CHARTS

Boston Harbor, New York Harbor, San Francisco Bay—Three volumes:
Published by the United States Coast and Geodetic Survey.
For sale by the United States Coast and Geodetic Survey, Washington, D. C., Field Stations of the United States Coast and Geodetic Survey, and authorized sales agents in the various ports.

NOTICE TO MARINERS

Issued by the United States Department of Commerce and by the Hydrographic Office, United States Navy Department.
Notices to Mariners are published weekly and may be secured free of charge from the United States Lighthouse Service and from the Hydrographic Office.

LIGHT LISTS

United States, Territories, and Possessions:
Published by the United States Lighthouse Service.
For sale by the Superintendent of Documents, Washington, D. C., and by authorized sales agents in the various ports.
Philippine Islands:
Published by the Department of Agriculture and Commerce, Navigation Division, Manila, Philippine Islands.
Copies of the List of Lights, Buoys, Beacons and Daymarks of the Philippine Islands may be secured free on application to the Director, Bureau of Commerce and Industry, Manila, P. I.
A limited number of Philippine Notice to Mariners and List of Lights, etc., are available for free distribution at the Coast and Geodetic Survey field stations at Seattle, Wash., San Francisco, Calif., and Honolulu, T. H.
Foreign Countries:
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C., and authorized sales agents in the various ports.

RADIO

Charts of Radiobeacon System, Atlantic and Gulf Coasts, Pacific Coast, and Great Lakes:
Free on application to the various superintendents of lighthouses.

Circular No. 1, Radio, Distribution of Weather Information, Forecasts, and Warnings by Radio for the Benefit of Marine, Aviation, and Commercial Interests:
Free on application to the Weather Bureau, United States Department of Agriculture, Washington, D. C.
List of Stations Performing Special Services:
Published and for sale by the Bureau of the International Telecommunication Union, Berne, Switzerland.
List of Coast Stations and Ship Stations:
Published and for sale by the Bureau of the International Telecommunication Union, Berne, Switzerland.
Radio Aids to Navigation (H. O. Publ. No. 205):
Published by the Hydrographic Office, United States Navy Department.
For sale by the Hydrographic Office, Washington, D. C.
Radiobeacons and Radiobeacon Navigation:
Published by the United States Lighthouse Service.
For sale by the Superintendent of Documents, Washington, D. C.
List of Radiobeacons:
See Light Lists published by the United States Lighthouse Service.

MISCELLANEOUS

American Practical Navigator (Bowditch):
Published by the Hydrographic Office, United States Navy Department.
For sale by the Superintendent of Documents, Washington, D. C.
Annual Report of the Chief of Engineers, United States Army:
Part 1.—Report upon river and harbor improvement work, including flood-control operations.
Part 2.—Commercial Statistics, Water-borne Commerce of the United States.
These volumes may be consulted at the libraries which are public depositories.
General Rules and Regulations Prescribed by the Board of Supervising Inspectors—four volumes:
Published by and issued free on application to the Bureau of Navigation and Steamboat Inspection, United States Department of Commerce, Washington, D. C.
Laws Governing Steamboat Inspection:
Published by and free on application to the Bureau of Navigation and Steamboat Inspection, United States Department of Commerce, Washington, D. C.
List of Bridges Over the Navigable Waters of the United States:
Published by the United States Engineers. (1934 edition now in press.)
For sale by the Superintendent of Documents, Washington, D. C.
Navigation Laws of the United States:
Published by the Bureau of Navigation and Steamboat Inspection, United States Department of Commerce.
For sale by the Superintendent of Documents, Washington, D. C.
Pilot Rules for Certain Inland Waters of Atlantic and Pacific Coasts and Coast of Gulf of Mexico:
Published by and free on application to the Bureau of Navigation and Steamboat Inspection, United States Department of Commerce, Washington, D. C.
Pilot Rules for Rivers whose Waters Flow into the Gulf of Mexico and Their Tributaries and Red River of North:
Published by and free on application to the Bureau of Navigation and Steamboat Inspection, United States Department of Commerce, Washington, D. C.
Pilot Rules for Great Lakes and Their Connecting and Tributary Waters:
Published by and free on application to the Bureau of Navigation and Steamboat Inspection, United States Department of Commerce, Washington, D. C.
Port and Terminal Charges at United States Ports:
Prepared by the Board of Engineers for Rivers and Harbors, War Department, in cooperation with the United States Shipping Board.
For sale by the Superintendent of Documents, Washington, D. C.
Port Series—of the United States—23 volumes:
Prepared by the Board of Engineers for Rivers and Harbors, War Department, in cooperation with the United States Shipping Board.
For sale by the Superintendent of Documents, Washington, D. C.

Regulations for Lighting Bridges:
Published by and free on application to the United States Lighthouse Service, Washington, D. C.
Shipping Charges at United States and Foreign Ports; Consular Services and Charges:
Prepared by the Board of Engineers for Rivers and Harbors, War Department, in cooperation with the United States Shipping Board.
For sale by the Superintendent of Documents, Washington, D. C.
The American Ephemeris and Nautical Almanac:
Published by the United States Naval Observatory.
For sale by the Superintendent of Documents, Washington, D. C.

REMARKS ON THE USE OF CHARTS

Accuracy of charts.—The value of a chart depends upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become. In these respects the source from which the information has been compiled is a good guide. This applies particularly to the charts of the Alaska Peninsula, Aleutian Islands, Arctic Ocean, and part of Bering Sea, and the Philippine Islands. The early Russian and Spanish surveys were not made with great accuracy, and until they are replaced by later surveys these charts must be used with caution.

With respect to these regions, the fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail. A wide berth should, therefore, be given to every rocky shore or patch, and this rule should invariably be followed, viz, that instead of considering a coast to be clear unless it is shown to be foul the contrary should be assumed.

With respect to a well-surveyed coast, only a fractional part of the soundings obtained are shown on the chart, a sufficient number being selected to clearly indicate the contour of the bottom. When the bottom is uneven the soundings will be found grouped closely together, and when the slopes are gradual fewer soundings are given. Each sounding represents an actual measure of depth and location at the time the survey was made. Shores and shoals where sand and mud prevail, and especially bar harbors and the entrances of bays and rivers exposed to strong tidal currents and a heavy sea, are subject to continual change of a greater or less extent, and important ones may have taken place since the date of the last survey. In localities which are noted for frequent and radical changes, such as the entrance to a number of estuaries on the Atlantic, Gulf, and Pacific coasts, notes are printed on the charts calling attention to the fact.

It should also be remembered that in coral regions and where rocks abound it is always possible that a survey with lead and line, however detailed, may have failed to find every small obstruction. For these reasons, when navigating such waters, the customary sailing lines and channels should be followed and those areas avoided where the irregular and sudden changes in depth indicate conditions which are associated with pinnacle rocks or coral heads.

Dredged channels.—These are generally shown upon the chart by two broken lines to represent the side limits of the improvement together with the depth and date. The depth is the controlling depth through the channel on the date charted and does not mean that this depth obtains over the full width of the channel, nor that the depth has not subsequently changed due to either shoaling or dredging. These changes are often of frequent occurrence; therefore, when vessels' drafts approximate the charted depth of a dredged channel local information as to conditions should be obtained before entering.

Danger curves.—The depth curves will be found useful in giving greater prominence to outlying dangers. It is a good plan to trace out with a colored pencil the curve next greater than the draft of the vessel using the chart and regard this as a "danger curve", which is not to be crossed without precaution. Isolated soundings shoaler than surrounding depths should be avoided, as there is always the possibility that the shoalest spot may not have been found.

Caution in using small-scale charts.—It is obvious that dangers to navigation cannot be shown with the same amount of detail on small-scale charts as on those of larger scale; therefore in approaching the land or dangerous banks

regard should be had to the scale of the chart, and the largest scale chart available should be used. A small error in laying down a position means only yards on a large-scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. For the same reason bearings to near objects should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

Distortion of printed charts.—The majority of Coast and Geodetic Survey charts are now printed by lithography on dry paper and have little, if any, distortion. A lithographed chart may be distinguished from a plate-printed chart by the feel of the surface, the former being smooth, while the latter is rough. Lithographed charts also are usually tinted in colors, while the others are in black and white.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact position, especially when in exposed positions. It is safer, when possible, to navigate by bearings or angles to fixed objects on shore and by the use of soundings.

Lighted buoys and other unwatched lights cannot be implicitly relied on; the light may be altogether extinguished or, if flashing or occulting, the apparatus may get out of order.

Lights.—The distances given in the light lists, Coast Pilots, and on the charts for the visibility of lights are computed for a height of 15 feet (4.6 m) for the observer's eye. The table of distances of visibility due to height, published in the light list, affords a means of ascertaining the effect of a greater or less height of the eye. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range of visibility. Again, refraction may often cause a light to be seen farther than under ordinary circumstances. As the range of visibility increases with the elevation of the observer, it is often possible to obtain a bearing before the light is sighted from the bridge by sighting the light from aloft, noting a star in range with it, and then obtaining a bearing of the star with compass or pelorus.

The actual power of a light should be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen. The power of a light can be estimated by its candlepower as given in the light lists and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Light sectors.—Where lights have various colored sectors it should be borne in mind that the bearings of the edges of the sectors as given in the light lists and Coast Pilots are in degrees true, reading clockwise from 0° at N. as **observed from a vessel.**

In some conditions of the atmosphere white lights may have a reddish hue; the mariner, therefore, should not trust solely to color where there are sectors, but should verify the position by taking a bearing on the light. On either side of the line of demarcation between white and red there is always a small sector of uncertain color, as the edges of a sector cannot be cut off sharply.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the wind, large areas of silence have been found in different direction and at different distances from the origin of the sound signal, even in clear weather. Therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal may require some time before it is in readiness to act. A fog often creeps imperceptibly toward the land and is not observed by those at a lighthouse until it is upon them, whereas a vessel may have been in it for many hours while approaching the land. In such a case no signal may be sounded. When sound travels against the wind it may be thrown upward; in such a case a man aloft might hear it when it is inaudible on deck. The conditions for hearing a signal will vary at the same station within short intervals of time. Mariners must not, therefore, judge their distance from a fog signal by the force of the sound and must not assume that a signal is not sounding because they do not hear it. Taken together, these facts should induce the utmost caution when nearing the land or danger in fog. The lead or an echo-sounding instrument are often the

only safe guide and should be faithfully used. The establishment of radiobeacons and radio direction-finder stations combined with the use of radio direction-finder apparatus aboard ship have greatly facilitated the fixing of position in fog.

In regions where the shores are high and rocky the echo of the whistle frequently gives warning of too close an approach to shore. In narrow passages it is often possible to keep in mid-channel by directing course so that the echoes from both shores are heard at approximately the same time.

An echo may sometimes be heard from the boarded side of a beacon (echo board) or from a flat surface of any structure. A megaphone is said to be helpful for detecting sound and for determining the direction to the source.

Submarine signals, installed on many lightships and buoys, have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus can determine the approximate bearing of the signal, and when the sound signals (air or submarine) are synchronized with the radiobeacon the distance from the lightship may be determined. See page 20. These signals can be heard also on vessels not equipped with receiving apparatus by observers below the water line, but a bearing of the signal cannot then be readily determined.

Tides.—A knowledge of the tide, or vertical rise and fall of the water, is of great and direct importance whenever the depth at low water approximates or is less than the draft of the vessel and wherever docks are constructed so as to be entered and left near the time of high water. But under all conditions such knowledge may be of indirect use, as it often enables the mariner to estimate in advance whether at a given time and place the current will be running flood or ebb.

Plane of reference for soundings on charts.—For the Atlantic coast of the United States and Puerto Rico the plane of reference for soundings is the mean of all low waters; for the Pacific coast of the United States and Alaska, with the one exception noted below, and for the Hawaiian and Philippine Islands, it is the mean of the lower low waters. For the Atlantic coast of the Canal Zone, Panama, the plane of reference for soundings is mean low water, and for the Pacific coast of the same it is low-water springs. For foreign charts many different planes of reference are in use, but that most frequently adopted is low-water springs.

It should be remembered that whatever plane of reference is used for a chart there may be times when the tide falls below it. When the plane is mean low water or mean lower low water, there will generally be as many low waters or lower low waters below those planes as above them; also the wind may at times cause the water to fall below the plane of reference.

Tidal currents.—In navigating where the tidal range is considerable, special caution is necessary. It should be remembered that along the coast there are indrafts into all bays and bights, although the general set of the current is parallel to the shore; and that the effect of a crosscurrent is greater on a vessel running slowly than when at full speed. The turn of the tidal current offshore is seldom coincident with the time of high and low water on the shore.

At the entrance to most harbors without important tributaries or branches, the current turns at, or soon after, the time of high and low water within. The diurnal inequality in the velocity of current will be proportionately but half as great as in the height of the tides. Hence, although the heights of the tide may be such as to cause the surface of the water to vary but little in level for 10 or 12 hours, the ebb and flow will be much more regular in occurrence. A swift current often occurs in narrow openings between two bodies of water because the water at a given instant may be at different levels. Along most shores not seriously affected by bays, tidal rivers, etc., the current usually turns soon after high and low waters.

The swiftest current in straight portions of tidal rivers is usually in the midchannel, but in curved portions the strongest current is toward the outer edge of the curve. Counter currents and eddies may occur near the shore of straits, especially in bights and near points.

Tide rips and swirls occur in places where strong currents occur, caused by a change in the direction of the current, and especially over shoals or in places where the bottom is uneven. Such places should be avoided if exposed also to a heavy sea, especially with the wind opposing the current. When these conditions are the worst the water is broken into heavy choppy seas from all directions, which board the vessel, and also make it difficult to keep control, owing to the plunging effects of the propeller and rudder.

The current tables published by the Coast and Geodetic Survey give the predicted times of slack water and other current data for a number of places on the Pacific and Atlantic coasts of North America.

Current arrows on charts show only the usual or mean direction of a tidal stream or current. It must not be assumed that the direction of the current will not vary from that indicated by the arrow. In the same manner the velocity of the current constantly varies with circumstances, and the rate given on the chart is a mean value, corresponding to an average range of tide. At some stations but few observations have been made.

Fixing position.—The most accurate method available to the navigator for fixing a position relative to the shore is by plotting with a protractor sextant angles between well-defined objects on the chart. This method, based on the "*three-point problem*" of geometry, should be in general use.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by this method. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might, under such circumstances, put the ship ashore. For its successful employment it is necessary, first, that the objects be well chosen, and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice.

Near objects should be used either for bearings or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn. On the other hand, distant objects should be used for direction because less affected by a small error or change of position. The three-arm protractor consists of a graduated circle with one fixed and two movable radial arms. The zero of the graduation is at the fixed arm, and by turning the movable arms each one can be set at any desired angle with reference to the fixed arm.

To plot a position, the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges in case of a metal instrument, or the radial lines in the case of a transparent or celluloid instrument, pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole. The tracing-paper protractor, consisting of a graduated circle printed on tracing paper, can be used as a substitute for the brass or celluloid instrument. The paper protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through the three objects, it will be indeterminate, as it will plot all around the circle. An approach to this condition, which is called a "revolver", must be avoided. In case of doubt, select from the chart three objects nearly in a straight line or with the middle object nearest the observer. Near objects are better than distant ones, and, in general, up to 90°, the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer, the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation. A single angle and a range give, in general, an excellent fix, easily obtained and plotted.

The compass.—It is not intended that the use of the compass to fix the position should be given up. There are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. Where accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal or of additions to a chart, as fresh soundings or new buildings. In such cases, angles should be taken to several objects, the more the better; but five objects are a good number, as the four angles thus

obtained usually establish a position free of any doubt. When only two objects are visible, a sextant angle can be used to advantage with the compass bearings and a better fix obtained than by two bearings alone.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "bow and beam bearing", the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam when the position is obtained. By taking the bearing at two points and four points on the bow a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval allowing for current. Taking afterward the beam bearing gives, with slight additional trouble, the distance of the object when abeam. Such beam bearings and distances, with the times, should be continually recorded as fresh departures, the importance of which will be appreciated in case of being suddenly shut in by fog. A graphic solution of the problem for any two bearings of the same object is frequently used. The two bearings are drawn on the chart, and the course is then drawn by means of the parallel rulers, so that the distance as measured from the chart between the lines is equal to the distance made good by the vessel between the times of taking the bearings.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten.

Range finders.—Vessels equipped with range-finding apparatus have a ready means for determining the distance from an object and, combined with a bearing, can fix their position at any time when objects are visible.

Soundings.—In thick weather, when near or approaching the land or danger, soundings should be taken continually and at regular intervals, and with the character of the bottom systematically recorded. By marking the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship and then moving the paper over the chart parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined.

Echo sounding.—This modern method of obtaining soundings is coming into use extensively. Its advantages lie in the fact that rapid and almost instantaneous soundings can be had while the vessel is running at full speed, and the navigator thereby knows at all times the depth of water under his keel. The method of determining the ship's position as described in the preceding paragraph is eminently applicable when echo soundings are obtained. Two types of instruments have been brought out. In one type, the returning echo is flashed on a revolving plate and the depth read by an adjacent scale, while with the other type the depths are recorded on a graph.

By means of echo soundings, a vessel can follow a safe depth curve with ease, and dangerous points and capes can be rounded in thick weather with utmost safety.

Echo sounding has been developed to such an extent that it is now used by the surveying vessels of the Coast and Geodetic Survey and has practically replaced the use of the pressure tube.

Use of sounding tubes.—Although of undoubted value as a navigational instrument, the sounding tube is subject to certain defects which, operating singly or in combinations, may give results so misleading as to seriously endanger the vessel, whose safety is entirely dependent upon an accurate knowledge of the depths. There are various types of tubes in common use which are too well known to require a detailed description here. They are all based on the principle that the column of air in the tube will be compressed in proportion to the depth to which the tube is lowered in the water. The principle is sound theoretically, but in practice there are several sources of mechanical errors which affect the result in proportion to the depth of water determined. The most important sources of errors are as follows:

(*a*) *Inherent:* Those which occur as a result of permanent defects in the tube, such as the variation of the bore from a true cylinder, variation in the thickness of the cap, etc.

(*b*) *External:* Those which occur as a result of the conditions under which the sounding was taken, variations of temperature or barometric pressure from the normal, etc.

(c) *Accidental:* Those which affect a single sounding, due to the failure of the tube to register properly, leakage of air, loss of water from leaky valve, errors due to the presence of salt in the tube, etc.

Before undertaking the sounding necessary to make any particular landfall the vessel should be stopped for an up-and-down cast of the lead in order to test the accuracy under the prevailing conditions of the tubes which are to be used. For this purpose it is not necessary to get bottom; simply run out 60 to 80 fathoms of wire and then see how closely the tubes register that amount. A number of tubes can be sent down at one time, and it is then possible to select one or two which register most nearly correct. The accidental errors are probably the most serious of the three types, both because they are apt to be larger in amount and because it is impossible to foresee when they will occur. It should be kept in mind that tubes which have been working properly for a number of soundings may suddenly develop errors, and for this reason the mariner must beware of overconfidence in the tubes.

Sumner's method.—Among astronomic methods of fixing a ship's position the great utility of Sumner's method or one of its many modifications should be well understood, and this method should be in constant use. The Sumner line—that is, the line drawn through the two positions obtained by working the chronometer observation for longitude with two assumed latitudes, or by drawing through the position obtained with one latitude a line at right angles to the bearing of the body as obtained from the azimuth tables—gives at times invaluable information, as the ship must be somewhere on that line, provided the chronometer is correct. If directed toward the coast, it marks the bearing of a definite point; if parallel with the coast, the distance of the latter is shown. Thus the direction of the line may often be usefully taken as a course. A sounding at the same time with the observation may often give an approximate position on the line. A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The Sumner lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterward or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day, and in combination with the sun gives an excellent fix.

Position line by means of tables.—The Sumner line of position furnished ready to lay down on the chart may be derived from the tables of "Simultaneous Hour Angle and Azimuth of Celestial Bodies", published by the Hydrographic Office as Publication No. 203. By means of these tables all calculations are avoided, but they are not recommended for use within an hour of the meridian, when the Marc St. Hilaire Method of Ex-Meridian Tables should be substituted.

Position line by Marc St. Hilaire or calculated altitude method.—By this method the altitude of the celestial body is calculated for the assumed position, and the difference between the observed and calculated altitudes is laid off toward or away from the assumed position, according to sign, along the azimuth of the observed body. The line of position is then drawn through the new point in a direction normal to the azimuth of the celestial body. This method has certain advantages, the principle one being that the solution is strong even when the body is near the meridian. Full description of this method will be found in any epitome of navigation.

Radio direction finder bearings and positions are especially valuable at night and during fog or thick weather when other observations are not obtainable. For practical navigating purposes radio waves may be regarded as traveling in a straight line from the sending station to the receiving station. Instruments for determining the bearing of this line are now available. The observations may be divided into two general classes: First, where the bearing of the ship's radio call is determined by one, two, or more radio stations on shore and the resulting bearing or position is reported to the vessel (see p. 21); secondly, where the bearing of one or more known radio stations is determined on the vessel itself and plotted as a line of position or as cross bearings. Experiments show that these bearings can be determined with a probable error of less than 2°, and the accuracy of the resulting position is largely dependent on the skill and care of the observer. It must be remembered, however, that these lines are parts of great circles, and if plotted as straight lines on a Mercator chart a

considerable error may result when the ship and shore station are a long distance apart. The bearings may be corrected for this distortion as explained on page 22.

Radio bearings may be combined with position lines obtained from astronomic observations and used in ways very similar to the well-known Sumner line when avoiding dangerous shoals or when making the coast.

Radiobeacons.—The United States Lighthouse Service now maintains and operates radiobeacons at a large number of lighthouses and lightships. In fog or thick weather these radiobeacons send distinctive signals and ships equipped with radio direction finders may readily obtain bearings on these beacons. For a detailed description, see page 18.

Radiobeacon stations that are equipped for distance finding, transmit a special radio signal and sound a corresponding air or submarine signal at the same period of time. The reception of the sound signal by a vessel will be delayed depending upon the distance the sound has to travel, whereas the radio signal will be received practically instantaneously.

Synchronization of sound and radio signals.—When the sound signal travels through water, the number of seconds intervening between the reception of the radio signal and sound signal divided by 1.25 gives the distance of the vessel in miles from the station. Where the sound signal travels through air the distance in miles is obtained by dividing the number of seconds by 5 (or more exactly 5.5).

For details as to the signal characteristics see the Light Lists published by the United States Lighthouse Service.

Change in variation of the compass.—The gradual change in the variation must not be forgotten in laying down positions by bearings on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are replotted for every new edition if the error is appreciable. Means for determining the amount of this error are provided by printing the date of constructing the compass and the annual change in variation near its edge.

The change in the magnetic variation in passing along parts of the coast of the United States is so rapid as to materially affect the course of a vessel unless given constant attention. This is particularly the case in New England and parts of Alaska, where the lines of equal magnetic variation are close together and show rapid changes in magnetic variation from place to place, as indicated by the large differences in variation given on neighboring compass roses.

A table giving the magnetic variation for 1936 and the annual increase or decrease at certain points within the area covered by this volume is given on page 37 under "General information."

Local magnetic disturbance.—The term "local magnetic disturbance" or "local attraction" has reference only to the effects on the compass of magnetic masses external to the ship. Observation shows that such disturbance of the compass in a ship afloat is experienced only in a few places. Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflection of the compass is due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centers near together. The law which has hitherto been found to hold good as regards local magnetic disturbance is that north of the magnetic equator the north end of the compass needle is attracted toward any center of disturbance; south of the magnetic equator it is repelled. It is very desirable that whenever an area of local magnetic disturbance is noted the position should be fixed and the facts reported as far as they can be ascertained.

USE OF OIL FOR MODIFYING THE EFFECT OF BREAKING WAVES

Many experiences of late years have shown that the utility of oil for this purpose is undoubted and the application simple. The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil skillfully applied may prevent much damage, both to

ships (especially of the smaller classes) and to the boats, by modifying the action of breaking seas. The principal facts as to the use of oil are as follows:

1. On free waves—that is, waves in deep water—the effect is greatest.

2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances, but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, and generally waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, either when running or lying-to or in wearing.

6. No experiences are related of its use when hoisting a boat at sea or in a seaway, but it is highly probable that much time would be saved and injury to the boat avoided by its use on such occasions.

7. In cold water the oil, being thickened by the lower temperature and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to facilitate leakage of the oil. The oil is also frequently distributed from canvas bags or oakum inserted in the closet bowls. The positions of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—for example, from the cathead—and allowed to tow in the water. With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter. Lying-to, the weather bow, and another position farther aft seem the best places from which to hang the bags, using sufficient line to permit them to draw to windward while the ship drifts.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances, the effect cannot be so much trusted. On a bar with the ebb tide running it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck it is recommended to pour oil overboard to windward of her before going alongside. The effect in this must greatly depend upon the set of the current and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat and the bag readily hauled on board for refilling if necessary.

INSTRUCTIONS TO MARINERS IN CASE OF SHIPWRECK

General information.—Coast Guard (lifesaving) stations and houses of refuge are located upon the Atlantic and Pacific seaboards of the United States, the Gulf of Mexico, and the Lake coasts.

The stations are manned throughout the year by crews of experienced surfmen.

All lifesaving stations are fully supplied with boats, wreck guns, beach apparatus, restoratives, and clothing provided by the Blue Anchor Society, women's national association for the shipwrecked requiring it, etc.

Houses of refuge are supplied with boats and restoratives but not manned by full crews; an officer in charge, and at places, one or two additional men reside in each, who are required to make extended excursions along the coast after every storm. with a view of ascertaining if any shipwreck has occurred and finding and succoring any persons that may have been cast ashore.

Houses of refuge are located exclusively upon the east coast of Florida, where the requirements of relief are different from those of other portions of the seaboard.

The lifesaving stations are provided with the International Code of Signals, and other means of visual signaling, and vessels can, by opening communica-

tion, be reported; or obtain the latitude or longitude of the station, where determined; or information as to the weather probabilities in most cases; or, where facilities for the transmission of messages by telephone or telegraph are available, request for a tug or Coast Guard cutter will be received and promptly forwarded.

All services are performed by the lifesaving crews without other compensation than their pay from the Government.

Destitute seafarers are provided with food and lodging at the nearest station by the Government as long as necessarily detained by the circumstances of shipwreck, and, if needed, with clothing provided by the Blue Anchor Society.

The station crews patrol the beach from 2 to 4 miles each side of their stations between sunset and sunrise, and if the weather is foggy the patrol is continued through the day. A continuous lookout is also maintained at every station night and day.

Each patrolman carries warning signals. Upon discovering a vessel standing into danger he ignites one of these, which emits a brilliant red flame of about 2 minutes' duration, to warn her off, or, should the vessel be ashore, to let her crew know that they are discovered and assistance is at hand.

If the vessel is not discovered by the patrol immediately after striking, rockets, flare-up lights, or other recognized signals of distress should be used. If the weather be foggy, some recognized sound signal should be made to attract attention, as the patrolman may be some distance away at the other end of his beat.

Masters are particularly cautioned, if they should be driven ashore anywhere in the neighborhood of the stations, to remain on board until assistance arrives, and under no circumstances should they attempt to land through the surf in their own boats until the last hope of assistance from the shore has vanished. Often when comparatively smooth at sea a dangerous surf is running which is not perceptible 400 yards offshore, and the surf when viewed from a vessel never appears as dangerous as it is. Many lives have been lost unnecessarily by the crews of stranded vessels being thus deceived and attempting to land in the ship's boats.

The difficulties of rescue by operations from the shore are greatly increased in cases where the anchors are let go *after entering the breakers*, as is frequently done, and the chances of saving life correspondingly lessened.

Rescue with the lifeboat or surfboat.—The patrolman after discovering your vessel ashore and burning a warning signal, hastens to his station or the telephone for assistance. If the use of a boat is practicable, either the large lifeboat is launched from its ways in the station and proceeds to the wreck by water, or the lighter surfboat is hauled overland to a point opposite the wreck and launched, as circumstances may require.

Upon the boat reaching your vessel the directions and orders of the officer in charge (who always commands and steers the boat) should be implicitly obeyed. Any headlong rushing and crowding should be prevented, and the captain of the vessel should remain on board, to preserve order, until every other person has left.

Women, children, helpless persons, and passengers should be passed into the boat first.

Goods or baggage will positively not be taken into the boat until all are landed. If any be passed in against the remonstrance of the officer in charge, he is fully authorized to throw the same overboard.

Rescue with the breeches buoy or life car.—Should it be inexpedient to use either the lifeboat or surfboat, recourse will be had to the wreck gun and beach apparatus for the rescue by the breeches buoy or the life car.

A shot with a small line attached will be fired across your vessel. Get hold of the line as soon as possible and haul on board until you get a tailblock with a whip or endless line rove through it. The tailblock should be hauled on board as quickly as possible to prevent the whip drifting off with the set or fouling with wreckage, etc. Therefore if you have been driven into the rigging, where but one or two men can work to advantage, cut the shot line, and run it through some available block, such as the throat or peak-halyards block, or any block which will afford a clear lead, or even between the ratlines, that as many as possible may assist in hauling.

Attached to the tailblock will be a tally board with the following directions in English on one side and French on the other:

"Make the tail of the block fast to the lower mast, well up. If the masts are gone, then to the best place you can find. *Cast off shot line, see that the rope in the block runs free*, and show signal to the shore."

The above instruction being complied with, the result will be shown in figure 1.

As soon as your signal is seen a 3-inch hawser will be bent onto the whip and hauled off to your ship by the lifesaving crew.

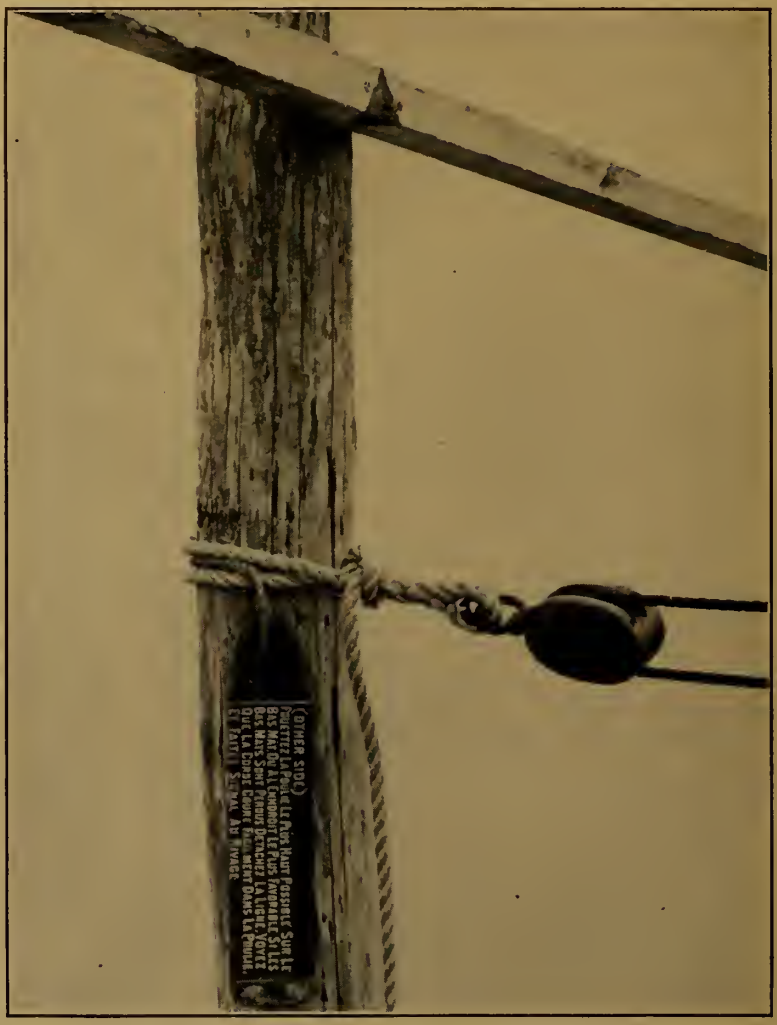


FIGURE 1.

If circumstances permit, you can assist the lifesaving crew by manning that part of the whip to which the hawser is bent and hauling with them.

When the end of the hawser is got on board, a tally board will be found attached, bearing the following directions in English on one side and French on the other:

"Make this hawser fast about 2 feet above the tailblock, see all clear and that the rope in the block runs free, and show signal to the shore."

These instructions being obeyed, the result will be shown in figure 2.

Take particular care that there are no turns of the whip line around the hawser. To prevent this, take the end of the hawser up between the parts of the whip before making it fast.

When the hawser is made fast, the whip cast off from the hawser, and your signal seen by the lifesaving crew, they will haul the hawser taut and by means of the whip will haul off to your vessel a breeches buoy suspended from a traveler block, or a life car, from rings running on the hawser.

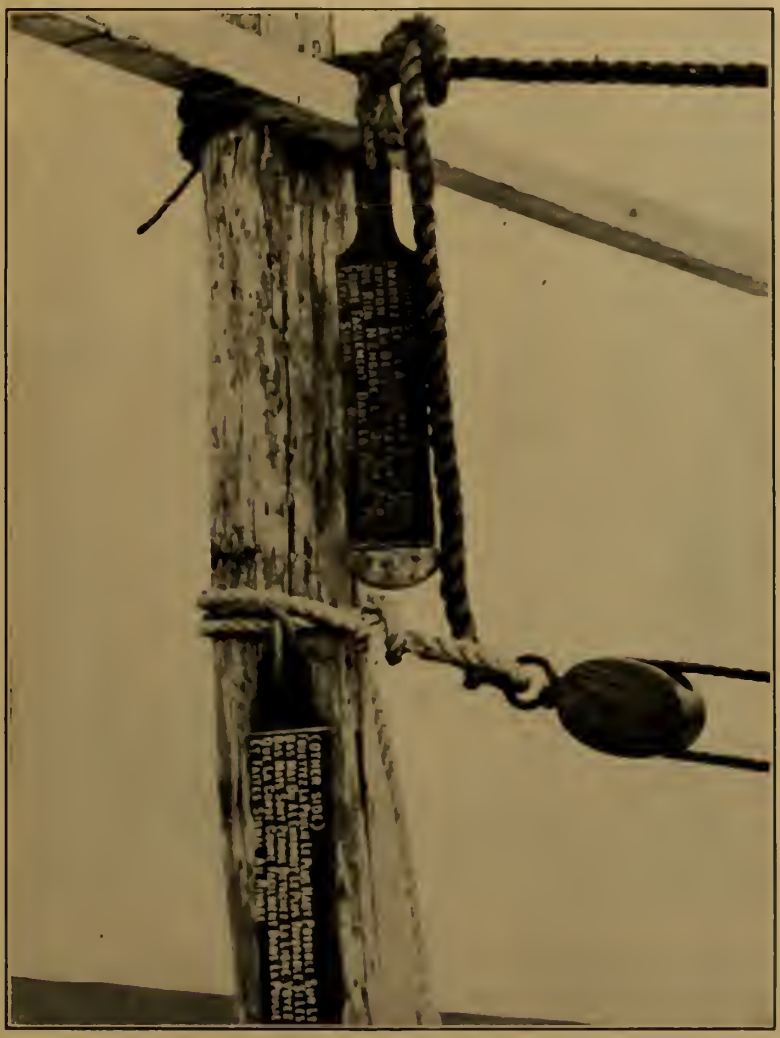


FIGURE 2.

Figure 3, below, represents the apparatus rigged, with the breeches buoy hauled off to the ship.

If the breeches buoy be sent, let one man immediately get into it, thrusting his legs through the breeches. If the life car, remove the hatch, place as many persons therein as it will hold (four to six) and secure the hatch on the outside by the hatch bar and hook, signal as before, and the buoy or car will be hauled ashore. This will be repeated until all are landed. On the last trip of the life car the hatch must be secured by the inside hatch bar.

In many instances two men can be landed in the breeches buoy at the same time by each putting a leg through a leg of the breeches and holding onto the lifts of the buoy.

Children when brought ashore by the buoy, should be in the arms of older persons or securely lashed to the buoy. Women and children should be landed first.

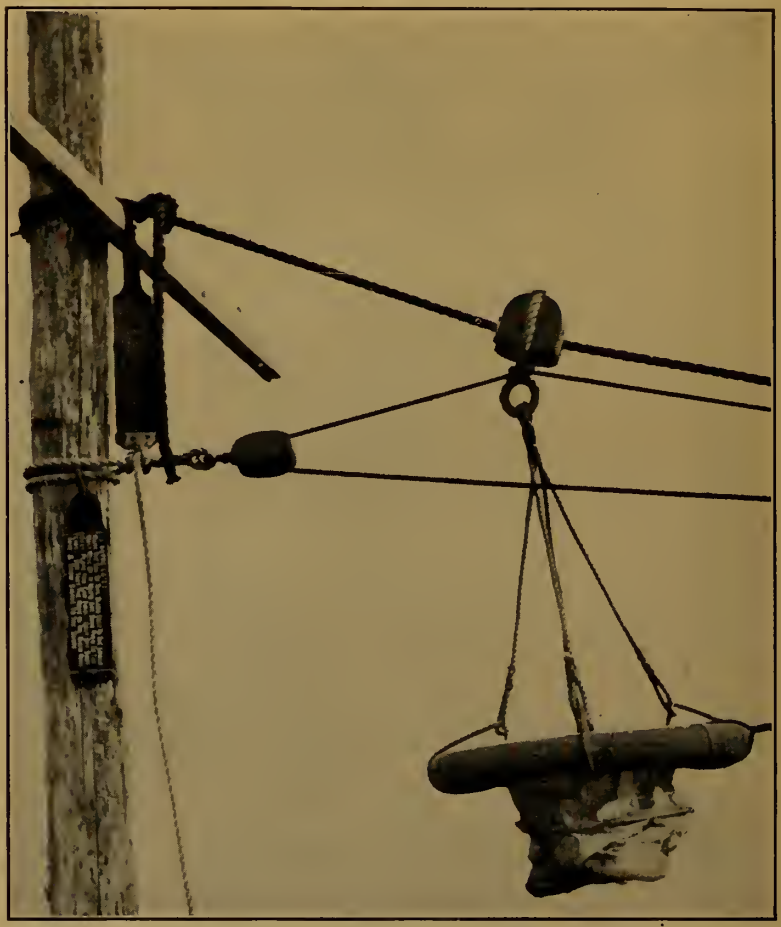


FIGURE 3.

In signaling as directed in the foregoing instructions, if in the daytime, let one man separate himself from the rest and swing his hat, a handkerchief, or his hand; if at night, the showing of a light and concealing it once or twice will be understood; and like signals will be made from the shore. (See also "Wreck Signals", below.)

Circumstances may arise, owing to the strength of the current or set or the danger of the wreck breaking up immediately, when it would be impossible to send off the hawser. In such a case a breeches buoy or life car will be hauled off instead by the whip or sent off to you by the shot line, and you will be hauled ashore through the surf.

If your vessel is stranded during the night and discovered by the patrolman—which you will know by his burning a brilliant red light—keep a sharp lookout for signs of the arrival of the lifesaving crew abreast of your vessel.

Some time may intervene between the burning of the light and their arrival, as the patrolman may have to return to his station, perhaps 3 or 4 miles distant, and the lifesaving crew draw the apparatus or surfboat through the sand or over bad roads to where your vessel is stranded.

Lights on the beach will indicate their arrival, and the sound of cannon firing from the shore may be taken as evidence that a line has been fired across your vessel. Therefore upon hearing the cannon, make strict search aloft, fore, and aft, for the shot line, for it is almost certain to be there. Though the movement of the lifesaving crew may not be perceptible to you, owing to the darkness, your vessel will be a good mark for the men experienced in the use of the wreck gun, and the first shot seldom fails.

Important.—Remain by the wreck until assistance arrives from the shore, or as long as possible. If driven aloft, the inshore mast is the safest.

If not discovered immediately by the patrol, burn rockets, flare-up, or other lights, or if the weather be foggy, fire guns or make other sound signals.

Make the shot line fast on deck or to the rigging to prevent its being washed into the sea and possibly fouling the gear.

Take particular care that there are no turns of the whip line around the hawser before making the hawser fast.

Send the women, children, helpless persons, and passengers ashore first.

Make yourself thoroughly familiar with these instructions, and remember that on your coolness and strict attention to them will greatly depend the chances of success in bringing you and your people safely to land.

Wreck signals.—The following signals, approved by the International Marine Conference convened at Washington in October 1889, have been adopted by the Coast Guard Service and will be used and recognized by the officers and employees as occasion may require:

"Upon the discovery of a wreck by night, the lifesaving force will burn a red pyrotechnic light or a red rocket to signify, '*You are seen; assistance will be given as soon as possible.*'

"A red flag waved on shore by day, or a red light, red rocket, or red roman candle displayed by night, will signify, '*Haul away.*'

"A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket, or white roman candle fired by night, will signify, '*Slack away.*'

"Two flags, a white and red, waved at the same time on shore by day, or two lights, a white and a red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify, '*Do not attempt to land in your own boats; it is impossible.*'

"A man on shore beckoning by day, or two torches burning near together by night, will signify, '*This is the best place to land.*'

"Any of these signals may be answered from the vessel as follows: In the daytime, waving a flag, a handkerchief, a hat, or even the hand; at night, by firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwhale for a short time, and then concealing it."

BOUNDARY LINES OF THE HIGH SEAS

The following lines dividing the high seas from rivers, harbors, and inland waters described in this volume are designated and defined pursuant to section 2 of the act of Congress of February 19, 1895. Waters inshore of the lines here laid down are "inland waters", and upon them the inland rules and pilot rules made in pursuance thereof apply. Upon the high seas, viz, waters outside of the lines here laid down, the international rules apply. The following lines were made effective June 1, 1935:

INLAND WATERS ON THE ATLANTIC, GULF, AND PACIFIC COASTS OF THE UNITED STATES

General rule.—At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not prescribed herein, Inland Rules of the Road shall apply inshore of a line approximately parallel with the general trend of the shore, drawn through the outermost buoy or other aid to navigation of any system of aids.

Modifications of general rule.—Lines of demarcation have been established for the following specific areas of inland waters on the Atlantic coast of the United States where the Inland Rules of the Road are to be followed.

Chesapeake Bay and tributaries.—A line drawn from Cape Charles Lighthouse to Cape Henry Lighthouse.

Charleston Harbor.—A line drawn from Sullivans Island Coast Guard Station to Charleston Lighted Whistle Buoy C; thence to Charleston Lighthouse.

Savannah Harbor.—A line drawn from the southwesternmost extremity of Braddock Point to Tybee Lighted Whistle Buoy T; thence to a tank on Tybee Island beach, bearing approximately 281°.

St. Simon Sound, St. Andrew Sound, and Cumberland Sound.—Starting from the hotel located approximately ¾ mile, 63½° true, from St. Simon (rear) Lighthouse, a line drawn to St. Simon Lighted Whistle Buoy St. S.; thence to St. Andrew Sound Bar Buoy; thence to Fernandina Lighted Whistle Buoy 1F; thence to Amelia Island Lighthouse.

St. Johns River, Fla.—A line drawn from the east end of the north jetty to the east end of the south jetty.

Florida Reefs and Keys from Miami to Marquesas Keys.—A line drawn from the east end of the north jetty at the entrance to Miami, to Miami Lighted Whistle Buoy; thence to Fowey Rocks Lighthouse; thence to Pacific Reef Lighthouse; thence to Carysfort Reef Lighthouse; thence to Molasses Reef Lighthouse; thence to Alligator Reef Lighthouse; thence to Tennessee Reef Lighthouse; thence to Sombrero Key Lighthouse; thence to American Shoal Lighthouse; thence to Key West Entrance Lighted Whistle Buoy; thence to Sand Key Lighthouse; thence to Cosgrove Shoal Lighthouse; thence to westernmost extremity of Marquesas Keys.

INTERNATIONAL RULES TO PREVENT COLLISIONS OF VESSELS

Be it enacted by the Senate and House of Representative of the United States of America in Congress assembled, That the following regulations for preventing collisions at sea shall be followed by all public and private vessels of the United States upon the high seas in all waters connected therewith navigable by seagoing vessels.

PRELIMINARY

In the following rules every steam vessel which is under sail and not under steam is to be considered a sailing vessel, and every vessel under steam, whether under sail or not, is to be considered a steam vessel.

The words "steam vessel" shall include any vessel propelled by machinery.

A vessel is "under way", within the meaning of these rules, when she is not at anchor, or made fast to the shore, or aground.

RULES CONCERNING LIGHTS, AND SO FORTH

The word "visible" in these rules when applied to lights shall mean visible on a dark night with a clear atmosphere.

Article 1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

Art. 2. A steam vessel when under way shall carry—(a) On or in front of the foremast, or if a vessel without a foremast, then in the fore part of the vessel, at a height above the hull of not less than twenty feet, and if the breadth of the vessel exceeds twenty feet, then at a height above the hull not less than such breadth, so, however, that the light need not be carried at a greater height above the hull than forty feet, a bright white light, so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such a character as to be visible at a distance of at least five miles.

(b) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

(d) The said green and red side lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(e) A steam vessel when under way may carry an additional white light similar in construction to the light mentioned in subdivision (a). These two lights shall be so placed in line with the keel that one shall be at least fifteen feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

Art. 3. A steam vessel when towing another vessel shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than six feet apart, and when towing more than one vessel shall carry an additional bright white light six feet above or below such lights, if the length of the tow measuring from the stern of the towing vessel to the stern of the last vessel towed exceeds six hundred feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in article two (a), excepting the additional light, which may be carried at a height of not less than fourteen feet above the hull.

Such steam vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

Art. 4. (a) A vessel which from any accident is not under command shall carry at the same height as the white light mentioned in article two (a), where they can best be seen, and if a steam vessel, in lieu of that light two red lights, in a vertical line one over the other, not less than six feet apart, and of such a character as to be visible all around the horizon at a distance of at least two miles; and shall by day carry in a vertical line, one over the other, not less than six feet apart, where they can best be seen, two black balls or shapes, each two feet in diameter.

(b) a vessel employed in laying or in picking up a telegraph cable shall carry in the same position as the white light mentioned in article two (a), and if a steam vessel in lieu of that light three lights in a vertical line, one over the other, not less than six feet apart. The highest and lowest of these lights shall be red and the middle light shall be white, and they shall be of such a character as to be visible all around the horizon at a distance of at least two miles. By day she shall carry in a vertical line, one over the other, not less than six feet apart, where they can best be seen, three shapes not less than two feet in diameter, of which the highest and lowest shall be globular in shape and red in color and the middle one diamond in shape and white.

(c) The vessels referred to in this article, when not making way through the water, shall not carry the side lights, but when making way shall carry them.

(d) The lights and shapes required to be shown by this article are to be taken by other vessels as signals that the vessel showing them is not under command and cannot therefore get out of the way.

These signals are not signals of vessels in distress and requiring assistance. Such signals are contained in article thirty-one.

Art. 5. A sailing vessel under way and any vessel being towed shall carry the same lights as are prescribed by article two for a steam vessel under way with the exception of the white lights mentioned therein, which they shall never carry.

Art. 6. Whenever, as in the case of small vessels under way during bad weather, the green and red side lights cannot be fixed, these lights shall be kept at hand, lighted and ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the color of the light they respectively contain, and shall be provided with proper screens.

Art. 7. Steam vessels of less than forty, and vessels under oars or sails of less than twenty, tons gross tonnage, respectively, and rowing boats, when under

way, shall not be required to carry the lights mentioned in article two (*a*), (*b*), and (*c*), but if they do not carry them they shall be provided with the following lights:

First. Steam vessels of less than forty tons shall carry—

(*a*) In the fore part of the vessel or on or in front of the funnel, where it can best be seen, and at a height above the gunwale of not less than nine feet, a bright white light constructed and fixed as prescribed in article two (*a*), and of such a character as to be visible at a distance of at least two miles.

(*b*) Green and red side lights constructed and fixed as prescribed in article two (*b*) and (*c*), and of such a character as to be visible at a distance of at least one mile or a combined lantern showing a green light and a red light from right ahead to two points abaft the beam on their respective sides. Such lanterns shall be carried not less than three feet below the white light.

Second. Small steamboats, such as are carried by seagoing vessels, may carry the white light at a less height than nine feet above the gunwale, but it shall be carried above the combined lantern mentioned in subdivision one (*b*).

Third. Vessels under oars or sails of less than twenty tons shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which, on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

Fourth. Rowing boats, whether under oars or sail, shall have ready at hand a lantern showing a white light which shall be temporarily exhibited in sufficient time to prevent collision.

The vessels referred to in this article shall not be obliged to carry the lights prescribed by article four (*a*) and article eleven, last paragraph.

Art. 8. Pilot vessels when engaged on their station on pilotage duty shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all around the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side lights lighted ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

A pilot vessel of such a class as to be obliged to go alongside a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may, instead of the colored lights above mentioned, have at hand, ready for use, a lantern with green glass on the one side and red glass on the other, to be used as prescribed above.

Pilot vessels when not engaged on their station on pilotage duty shall carry lights similar to those of other vessels of their tonnage.

A steam pilot vessel, when engaged on her station on pilotage duty and in waters of the United States, and not at anchor, shall, in addition to the lights required for all pilot boats, carry at a distance of eight feet below her white masthead light a red light, visible all around the horizon and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles, and also the colored side lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty and in waters of the United States, and at anchor, she shall carry in addition to the lights required for all pilot boats the red light above mentioned, but not the colored side lights. When not engaged on her station on pilotage duty, she shall carry the same lights as other steam vessels.

Art. 9. Fishing vessels and fishing boats, when under way and when not required by this article to carry or show the lights hereinafter specified, shall carry or show the lights prescribed for vessels of their tonnage under way.

(*a*) Open boats, by which is to be understood boats not protected from the entry of sea water by means of a continuous deck, when engaged in any fishing at night, with outlying tackle extending not more than one hundred and fifty feet horizontally from the boat into the seaway, shall carry one all-around white light.

Open boats, when fishing at night, with outlying tackle extending more than one hundred and fifty feet horizontally from the boat into the seaway, shall carry one all-around white light, and in addition, on approaching or being approached by other vessels, shall show a second white light at least three feet

below the first light and at a horizontal distance of at least five feet away from it in the direction in which the outlying tackle is attached.

(*b*) Vessels and boats, except open boats as defined in subdivision (*a*), when fishing with drift nets, shall, so long as the nets are wholly or partly in the water, carry two white lights where they can best be seen. Such lights shall be placed so that the vertical distance between them shall be not less than 6 feet and not more than 15 feet, and so that the horizontal distance between them, measured in a line with the keel, shall be not less than 5 feet and not more than 10 feet. The lower of these two lights shall be in the direction of the nets, and both of them shall be of such a character as to show all around the horizon, and to be visible at a distance of not less than 3 miles.

Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea sailing fishing vessels of less than 20 ton gross tonnage shall not be obliged to carry the lower of these two lights. Should they, however, not carry it, they shall show in the same position (in the direction of the net or gear) a white light, visible at a distance of not less than 1 sea mile, on the approach of or to other vessels.

(*c*) Vessels and boats, except open boats as defined in subdivision (*a*), when line fishing with their lines out and attached to or hauling their lines, and when not at anchor or stationary within the meaning of subdivision (*h*), shall carry the same lights as vessels fishing with drift nets. When shooting lines, or fishing with towing lines, they shall carry the lights prescribed for a steam or sailing vessel under way, respectively.

Within the Mediterranean Sea and in the seas bordering the coasts of Japan and Korea, sailing fishing vessels of less than 20 tons gross tonnage shall not be obliged to carry the lower of these two lights. Should they, however, not carry it, they shall show in the same position (in the direction of the lines) a white light visible at a distance of not less than 1 sea mile on the approach of or to other vessels.

(*d*) Vessels when engaged in trawling, by which is meant the dragging of an apparatus along the bottom of the sea—

First. If steam vessels, shall carry in the same position as the white light mentioned in article 2 (*a*) a tricolored lantern so constructed and fixed as to show a white light from right ahead to two points on each bow, and a green light and a red light over an arc of the horizon from two points on each bow to two points abaft the beam on the starboard and port sides, respectively; and not less than 6 nor more than 12 feet below the tricolored lantern a white light in a lantern, so constructed as to show a clear, uniform, and unbroken light all around the horizon.

Second. If sailing vessels, shall carry a white light in a lantern, so constructed as to show a clear, uniform, and unbroken light all around the horizon, and shall also, on the approach of or to other vessels, show where it can best be seen a white flare-up or torch in sufficient time to prevent collision.

All lights mentioned in subdivision (*d*) first and second shall be visible at a distance of at least 2 miles.

(*e*) Oyster dredgers and other vessels fishing with dredge nets shall carry and show the same lights as trawlers.

(*f*) Fishing vessels and fishing boats may at any time use a flare-up light in addition to the lights which they are by this article required to carry and show, and they may also use working lights.

(*g*) Every fishing vessel and every fishing boat under 150 feet in length, when at anchor, shall exhibit a white light visible all around the horizon at a distance of at least 1 mile.

Every fishing vessel of 150 feet in length or upward, when at anchor, shall exhibit a white light visible all around the horizon at a distance of at least 1 mile, and shall exhibit a second light as provided for vessels of such length by article 11.

Should any such vessel, whether under 150 feet in length or of 150 feet in length or upward, be attached to a net or other fishing gear, she shall on the approach of other vessels show an additional white light at least 3 feet below the anchor light, and at a horizontal distance of at least 5 feet away from it in the direction of the net or gear.

(*h*) If a vessel or boat when fishing become stationary in consequence of her gear getting fast to a rock or other obstruction, she shall in daytime hang down the day signal required by subdivision (*k*); at night show the light or lights prescribed for a vessel at anchor; and during fog, mist, falling snow, or heavy

rainstorms make the signal prescribed for a vessel at anchor. (See subdivision (*d*) and the last paragraph of article 15.)

(*i*) In fog, mist, falling snow, or heavy rainstorms drift-net vessels attached to their nets, and vessels when trawling, dredging, or fishing with any kind of drag net, and vessels line fishing with their lines out, shall, if of 20 tons gross tonnage or upward, respectively, at intervals of not more than 1 minute make a blast; if steam vessels, with the whistle or siren, and if sailing vessels, with the foghorn, each blast to be followed by ringing the bell. Fishing vessels and boats of less than 20 tons gross tonnage shall not be obliged to give the above-mentioned signals; but if they do not, they shall make some other efficient sound signal at intervals of not more than 1 minute.

(*k*) All vessels or boats fishing with nets or lines or trawls, when under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket or other efficient signal where it can best be seen. If vessels or boats at anchor have their gear out, they shall, on the approach of other vessels, show the same signal on the side on which those vessels can pass.

The vessels required by this article to carry or show the lights hereinbefore specified shall not be obliged to carry the lights prescribed by article 4 (*a*) and the last paragraph of article 11.

Art. 10. A vessel which is being overtaken by another shall show from her stern to such last-mentioned vessel a white light or a flare-up light.

The white light required to be shown by this article may be fixed and carried in a lantern, but in such case the lantern shall be so constructed, fitted, and screened that it shall throw an unbroken light over an arc of the horizon of twelve points of the compass, namely, for six points from right aft on each side of the vessel, so as to be visible at a distance of at least 1 mile. Such light shall be carried as nearly as practicable on the same level as the side lights.

Art 11. A vessel under 150 feet in length when at anchor shall carry forward, where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light, in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of at least 1 mile.

A vessel of 150 feet or upwards in length when at anchor shall carry in the forward part of the vessel, at a height of not less than 20 and not exceeding 40 feet above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall not be less than 15 feet lower than the forward light, another such light.

The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

A vessel aground in or near a fairway shall carry the above light or lights and the two red lights prescribed by article 4 (a).

Art. 12. Every vessel may, if necessary in order to attract attention in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that cannot be mistaken for a distress signal.

Art. 13. Nothing in these rules shall interfere with the operation of any special rules made by the government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners, which have been authorized by their respective governments and duly registered and published.

Art. 14. A steam vessel proceeding under sail only, but having her funnel up, shall carry in daytime, forward, where it can best be seen, one black ball or shape 2 feet in diameter.

SOUND SIGNALS FOR FOG, AND SO FORTH

Art. 15. All signals prescribed by this article for vessels under way shall be given.

First. By "steam vessels", on the whistle or siren.

Second. By "sailing vessel" and "vessels towed", on the foghorn.

The words "prolonged blast" used in this article shall mean a blast of from four to six seconds' duration.

A steam vessel shall be provided with an efficient whistle or siren sounded by steam or by some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient foghorn, to be sounded by

mechanical means, and also with an efficient bell. In all cases where the rules require a bell to be used a drum may be substituted on board Turkish vessels, or a gong where such articles are used on board small seagoing vessels. A sailing vessel of twenty tons gross tonnage or upward shall be provided with a similar foghorn and bell.

In a fog, mist, falling snow, or heavy rainstorms, whether by day or night, the signals described in this article shall be used as follows, namely:

(*a*) A steam vessel having way upon her shall sound, at intervals of not more than two minutes, a prolonged blast.

(*b*) A steam vessel under way, but stopped, and having no way upon her, shall sound, at intervals of not more than two minutes, two prolonged blasts, with an interval of about one second between.

(*c*) A sailing vessel under way shall sound at intervals of not more than one minute, when on the starboard tack, one blast; when on the port tack, two blasts in succession; and when with the wind abaft the beam, three blasts in succession.

(*d*) A vessel when at anchor shall, at intervals of not more than one minute, ring the bell rapidly for about five seconds.

(*e*) A vessel when towing, a vessel employed in laying or in picking up a telegraph cable, and a vessel under way, which is unable to get out of the way of an approaching vessel through being not under command, or unable to maneuver as required by the rules, shall, instead of the signals prescribed in subdivisions (*a*) and (*c*) of this article, at intervals of not more than two minutes, sound three blasts in succession, namely: One prolonged blast followed by two short blasts. A vessel towed may give this signal and she shall not give any other.

Sailing vessels and boats of less than twenty tons gross tonnage shall not be obliged to give the above-mentioned signals; but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.

SPEED OF SHIPS TO BE MODERATE IN FOG, AND SO FORTH

Art. 16. Every vessel shall, in a fog, mist, falling snow, or heavy rainstorms, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel, the position of which is not ascertained, shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERING AND SAILING RULES—PRELIMINARY—RISK OF COLLISION

Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

Art. 17. When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other, as follows, namely:

(*a*) A vessel which is running free shall keep out of the way of a vessel which is close-hauled.

(*b*) A vessel which is close-hauled on the port tack shall keep out of the way of a vessel which is close-hauled on the starboard tack.

(*c*) When both are running free, with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(*d*) When both are running free, with the wind on the same side, the vessel which is to the windward shall keep out of the way of the vessel which is to the leeward.

(*e*) A vessel which has the wind aft shall keep out of the way of the other vessel.

Art 18. When two steam vessels are meeting end on, or nearly end on, so as to involve risk of collision, each shall alter her course to starboard, so that each may pass on the port side of the other.

This article only applies to cases where vessels are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two vessels which must, if both keep on their respective courses, pass clear of each other.

The only cases to which it does apply are when each of the two vessels is end on, or nearly end on, to the other; in other words, to cases in which, by day, each vessel sees the masts of the other in a line, or nearly in a line, with her own; and by night, to cases in which each vessel is in such a position as to see both the side lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course; or by night, to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light, or a green light without a red light, is seen ahead, or where both green and red lights are seen anywhere but ahead.

Art. 19. When two steam vessels are crossing, so as to involve risk of collision the vessel which has the other on her own starboard side shall keep out of the way of the other.

Art. 20. When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision, the steam vessel shall keep out of the way of the sailing vessel.

Art. 21. Where, by any of these rules, one of two vessels is to keep out of the way, the other shall keep her course and speed.

Note.—When, in consequence of thick weather or other causes, such vessel finds herself so close that collision cannot be avoided by the action of the giving-way vessel alone, she also shall take such action as will best aid to avert collision. [See articles twenty-seven and twenty-nine.]

Art. 22. Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

Art. 23. Every steam vessel which is directed by these rules to keep out of the way of another vessel, shall, on approaching her, if necessary, slacken her speed or stop or reverse.

Art. 24. Notwithstanding anything contained in these rules every vessel, overtaking any other, shall keep out of the way of the overtaken vessel.

Every vessel coming up with another vessel from any direction more than two points abaft her beam—that is, in such a position, with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side lights—shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel cannot always know with certainty whether she is forward of or abaft this direction from the other vessel she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

Art. 25. In narrow channels every steam vessel shall, when it is safe and practicable, keep to that side of the fairway or midchannel which lies on the starboard side of such vessel.

Art. 26. Sailing vessels under way shall keep out of the way of sailing vessels or boats fishing with nets, or lines, or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing vessels or boats.

Art. 27. In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

SOUND SIGNALS FOR VESSELS IN SIGHT OF ONE ANOTHER

Art. 28. The words "short blast" used in this article shall mean a blast of about one second's duration.

When vessels are in sight of one another, a steam vessel under way, in taking any course authorized or required by these rules, shall indicate that course by the following signals on her whistle or siren, namely:

One short blast to mean "I am directing my course to starboard."

Two short blasts to mean, "I am directing my course to port."

Three short blasts to mean, "My engines are going at full speed astern."

NO VESSEL UNDER ANY CIRCUMSTANCES TO NEGLECT PROPER PRECAUTIONS

Art. 29. Nothing in these rules shall exonerate any vessel, or the owner or master or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

RESERVATION OF RULES FOR HARBORS AND INLAND NAVIGATION

Art. 30. Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbor, river, or inland waters.

DISTRESS SIGNALS

Art. 31. When a vessel is in distress and requires assistance from other vessels or from the shore the following shall be the signals to be used or displayed by her, either together or separately, namely:

In the daytime: First. A gun or other explosive signal fired at intervals of about a minute.

Second. The international code signal of distress indicated by N C.

Third. The distance signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball.

Fourth. A continuous sounding with any fog-signal apparatus.

At night: First. A gun or other explosive signal fired at intervals of about a minute.

Second. Flames on the vessel (as from a burning tar barrel, oil barrel, and so forth).

Third. Rockets or shells throwing stars of any color or description, fired one at a time, at short intervals.

Fourth. A continuous sounding with any fog-signal apparatus.

INLAND RULES TO PREVENT COLLISION OF VESSELS

AN ACT To adopt regulations for preventing collisions upon certain harbors, rivers, and inland waters of the United States

Whereas the provisions of chapter eight hundred and two of the laws of eighteen hundred and ninety, and the amendments thereto, adopting regulations for preventing collisions at sea, apply to all waters of the United States connected with the high seas navigable by seagoing vessels, except so far as the navigation of any harbor, river, or inland waters is regulated by special rules duly made by local authority; and

Whereas it is desirable that the regulations relating to the navigation of all harbors, rivers, and inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal and the Red River of the North and rivers emptying into the Gulf of Mexico and their tributaries, shall be stated in one act: Therefore

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following regulations for preventing collision shall be followed by all vessels navigating all harbors, rivers, and inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal and the Red River of the North and rivers emptying into the Gulf of Mexico and their tributaries, and are hereby declared special rules duly made by local authority:

PRELIMINARY

In the following rules every steam vessel which is under sail and not under steam is to be considered a sailing vessel, and every vessel under steam, whether under sail or not, is to be considered a steam vessel.

The words "steam vessel" shall include any vessel propelled by machinery.

A vessel is "under way", within the meaning of these rules, when she is not at anchor, or made fast to the shore, or aground.

RULES CONCERNING LIGHTS, AND SO FORTH

The word "visible" in these rules, when applied to lights, shall mean visible on a dark night with a clear atmosphere.

Article 1. The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited.

Art. 2.[1] A steam vessel when under way shall carry—(*a*) On or in front of the foremast, or, if a vessel without a foremast, then in the fore part of the vessel, a bright white light so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side, and of such a character as to be visible at a distance of at least five miles.

(*b*) On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(*c*) On the port side a red light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, and of such a character as to be visible at a distance of at least two miles.

(*d*) The said green and red side lights shall be fitted with inboard screens projecting at least three feet forward from the light, so as to prevent these lights from being seen across the bow.

(*e*) A seagoing steam vessel when under way may carry an additional white light similar in construction to the light mentioned in subdivision (*a*). These two lights shall be so placed in line with the keel that one shall be at least fifteen feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

(*f*) All steam vessels (except seagoing vessels and ferryboats), shall carry in addition to green and red lights required by article two (*b*), (*c*), and screens as required by article two (*d*), a central range of two white lights; the after light being carried at an elevation at least fifteen feet above the light at the head of the vessel. The headlight shall be so constructed as to show an unbroken light through twenty points of the compass, namely, from right ahead to two points abaft the beam on either side of the vessel, and the after light so as to show all around the horizon.

Art. 3. A steam vessel when towing another vessel shall, in addition to her side lights, carry two bright white lights in a vertical line one over the other, not less than three feet apart, and when towing more than one vessel shall carry an additional bright white light three feet above or below such lights, if the length of the tow measuring from the stern of the towing vessel to the stern of the last vessel towed exceeds six hundred feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in article two (*a*) or the after range light mentioned in article two (*f*).

Such steam vessel may carry a small white light abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

Art. 5. A sailing vessel under way and any vessel being towed, except barges, canal boats, scows, and other vessels of nodescript type, when in tow of steam vessels, shall carry the same lights as are prescribed by article two for a steam vessel under way, with the exception of the white lights mentioned therein, which they shall never carry.

Art. 6. Whenever, as in the case of vessels of less than ten gross tons under way during bad weather, the green and red side lights cannot be fixed, these lights shall be kept at hand, lighted and ready for use; and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most

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[1] Article 2 is amended by act of Congress approved June 9, 1910, effective on and after July 9, 1910, in rules for lights required to be carried by every vessel propelled by machinery and not more than 65 feet in length, except tugboats and towboats propelled by steam. (See p. 333.)

visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than two points abaft the beam on their respective sides. To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the color of the light they respectively contain, and shall be provided with proper screens.

Art. 7. Rowing boats, whether under oars or sail, shall have ready at hand a lantern showing a white light which shall be temporarily exhibited in sufficient time to prevent collision.

Art. 8. Pilot vessels when engaged on their station on pilotage duty shall not show the lights required for other vessels, but shall carry a white light at the masthead, visible all around the horizon, and shall also exhibit a flare-up light or flare-up lights at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side lights lighted ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port side nor the red light on the starboard side.

A pilot vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board may show the white light instead of carrying it at the masthead, and may, instead of the colored lights above mentioned, have at hand, ready for use, a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

Pilot vessels, when not engaged on their stations on pilotage duty, shall carry lights similar to those of other vessels of their tonnage.

A steam pilot vessel when engaged on her station on pilotage duty and in waters of the United States, and not at anchor, shall in addition to the lights required for all pilot boats, carry at a distance of eight feet below her white masthead light a red light visible all around the horizon and of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least two miles, and also the colored side lights required to be carried by vessels when under way.

When engaged on her station on pilotage duty and in waters of the United States, and at anchor, she shall carry, in addition to the lights required for all pilot boats, the red light above mentioned, but not the colored side lights.

When not engaged on her station on pilotage duty, she shall carry the same lights as other steam vessels.

Art. 9. (*a*) Fishing vessels of less than ten gross tons, when under way and when not having their nets, trawls, dredges, or lines in the water, shall not be obliged to carry the colored side lights; but every such vessel shall, in lieu thereof, have ready at hand a lantern with a green glass on one side and a red glass on the other side, and on approaching to or being approached by another vessel such lantern shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port side nor the red light on the starboard side.

(*b*) All fishing vessels and fishing boats of ten gross tons or upward, when under way and when not having their nets, trawls, dredges, or lines in the water, shall carry and show the same lights as other vessels under way.

(*c*) All vessels, when trawling, dredging, or fishing with any kind of drag nets or lines, shall exhibit, from some part of the vessel where they can be best seen, two lights. One of these lights shall be red and the other shall be white. The red light shall be above the white light and shall be at a vertical distance from it of not less than six feet and not more than twelve feet; and the horizontal distance between them, if any, shall not be more than ten feet. These two lights shall be of such a character and contained in lanterns of such construction as to be visible all around the horizon, the white light a distance of not less than three miles and a red light of not less than two miles.

(*d*) Rafts or other water craft not herein provided for, navigating by hand power, horsepower, or by the current of the river, shall carry one or more good white lights, which shall be placed in such manner as shall be prescribed by the Board of Supervising Inspectors of Steam Vessels.

Art. 10. A vessel which is being overtaken by another, except a steam vessel with an after range light showing all around the horizon, shall show from her stern to such last-mentioned vessel a white light or a flare-up light.

Art. 11. A vessel under 150 feet in length when at anchor shall carry forward, where it can best be seen, but at a height not exceeding 20 feet above the hull, a white light, in a lantern so constructed as to show a clear, uniform, and unbroken light visible all around the horizon at a distance of at least 1 mile.

A vessel of 150 feet or upward in length when at anchor shall carry in the forward part of the vessel, at a height of not less than 20 and not exceeding 40 feet above the hull, 1 such light, and at or near the stern of the vessel, and at such a height that it shall be not less than 15 feet lower than the forward light, another such light. The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

Art. 12. Every vessel may, if necessary, in order to attract attention, in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that cannot be mistaken for a distress signal.

Art. 13. Nothing in these rules shall interfere with the operation of any special rules made by the government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners, which have been authorized by their respective governments, and duly registered and published.

Art. 14. A steam vessel proceeding under sail only, but having her funnel up, may carry in daytime, forward, where it can best be seen, one black ball or shape 2 feet in diameter.

SOUND SIGNALS FOR FOG, AND SO FORTH

Art. 15. All signals prescribed by this article for vessels under way shall be given:

1. By "steam vessels" on the whistle or siren.
2. By "sailing vessels" and "vessels towed" on the foghorn.

The words "prolonged blast" used in this article shall mean a blast of from 4 to 6 seconds' duration.

A steam vessel shall be provided with an efficient whistle or siren, sounded by steam or by some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient foghorn; also with an efficient bell. A sailing vessel of 20 tons gross tonnage or upward shall be provided with a similar foghorn and bell.

In fog, mist, falling snow, or heavy rainstorms, whether by day or night, the signals described in this article shall be used as follows, namely:

(*a*) A steam vessel under way shall sound, at intervals of not more than 1 minute a prolonged blast.

(*b*) A sailing vessel under way shall sound, at intervals of not more than 1 minute, when on the starboard tack, one blast; when on the port tack, two blasts in succession, and when with the wind abaft the beam, three blasts in succession.

(*c*) A vessel when at anchor shall, at intervals of not more than 1 minute, ring the bell rapidly for about 5 seconds.

(*d*) A steam vessel when towing shall, instead of the signals prescribed in subdivision (*a*) of this article, at intervals of not more than 1 minute, sound three blasts in succession, namely, one prolonged blast followed by two short blasts. A vessel towed may give this signal and she shall not give any other.

(*e*) All rafts or other water craft not herein provided for, navigating by hand power, horsepower, or by the current of the river, shall sound a blast of the foghorn, or equivalent signal, at intervals of not more than 1 minute.

SPEED OF SHIPS TO BE MODERATE IN FOG, AND SO FORTH

Art. 16. Every vessel shall, in a fog, mist, falling snow, or heavy rainstorm, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam vessel hearing, apparently forward of her beam, the fog signal of a vessel the position of which is not ascertained shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.

STEERING AND SAILING RULES—PRELIMINARY—RISK OF COLLISION

Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.

Art. 17. When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows, namely:

(*a*) A vessel which is running free shall keep out of the way of a vessel which is close-hauled.

(*b*) A vessel which is close-hauled on the port tack shall keep out of the way of a vessel which is close-hauled on the starboard tack.

(*c*) When both are running free with the wind on different sides, the vessel which has the wind on the port side shall keep out of the way of the other.

(*d*) When both are running free, with the wind on the same side, the vessel which is to the windward shall keep out of the way of the vessel which is to the leeward.

(*e*) A vessel which has the wind aft shall keep out of the way of the other vessel.

Art. 18. Rule I. When steam vessels are approaching each other head and head, that is, end on, or nearly so, it shall be the duty of each to pass on the port side of the other; and either vessel shall give, as a signal of her intention, one short and distinct blast of her whistle, which the other vessel shall answer promptly by a similar blast of her whistle, and thereupon such vessels shall pass on the port side of each other. But if the courses of such vessels are so far on the starboard of each other as not to be considered as meeting head and head, either vessel shall immediately give two short and distinct blasts of her whistle, which the other vessel shall answer promptly by two similar blasts of her whistle, and they shall pass on the starboard side of each other.

The foregoing only applies to cases where vessels are meeting end on or nearly end on, in such a manner as to involve risk of collision; in other words, to cases in which, by day, each vessel sees the masts of the other in a line or nearly in a line with her own, and by night to cases in which each vessel is in such a position as to see both the side lights of the other.

It does not apply by day to cases in which a vessel sees another ahead crossing her own course, or by night to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light without a green light or a green light without a red light is seen ahead, or where both green and red lights are seen anywhere but ahead.

Rule III. If, when steam vessels are approaching each other, either vessel fails to understand the course or intention of the other, from any cause, the vessel so in doubt shall immediately signify the same by giving several short and rapid blasts, not less than four, of the steam whistle.

Rule V. Whenever a steam vessel is nearing a short bend or curve in the channel, where, from the height of the banks or other cause, a steam vessel approaching from the opposite direction cannot be seen for a distance of half a mile, such steam vessel, when she shall have arrived within half a mile of such curve or bend, shall give a signal by one long blast of the steam whistle, which signal shall be answered by a similar blast, given by any approaching steam vessel that may be within hearing. Should such signal be so answered by a steam vessel upon the farther side of such bend, then the usual signals for meeting and passing shall immediately be given and answered; but, if the first alarm signal of such vessel be not answered, she is to consider the channel clear, and govern herself accordingly.

When steam vessels are moved from their docks or berths, and other boats are liable to pass from any direction toward them, they shall give the same signal as in the case of vessels meeting at a bend, but immediately after clearing the berths so as to be fully in sight they shall be governed by the steering and sailing rules.

Rule VIII. When steam vessels are running in the same direction, and the vessel which is astern shall desire to pass on the right or starboard hand of the vessel ahead, she shall give one short blast of the steam whistle, as a signal of such desire, and if the vessel ahead answers with one blast, she shall put her helm to port; or if she shall desire to pass on the left or port side of the vessel ahead, she shall give two short blasts of the steam whistle as a signal of such desire, and if the vessel ahead answers with two blasts, shall put her helm to starboard; or if the vessel ahead does not think it safe for the vessel astern to attempt to pass at that point, she shall immediately signify the same by giving several short and rapid blasts of the steam whistle, not less than four, and under no circumstances shall the vessel astern attempt to pass the vessel ahead until such time as they have reached a point where it can be safely done, when said vessel ahead shall signify her willingness by blowing the proper signals. The vessel ahead shall in no case attempt to cross the bow or crowd upon the course of the passing vessel.

Rule IX. The whistle signals provided in the rules under this article, for steam vessels meeting, passing, or overtaking, are never to be used except when steamers are in sight of each other, and the course and position of each can be determined in the daytime by a sight of the vessel itself, or by night by seeing its signal lights. In fog, mist, falling snow, or heavy rainstorms, when vessels cannot so see each other, fog signals only must be given.

Art. 19. When two steam vessels are crossing, so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other.

Art. 20. When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision, the steam vessel shall keep out of the way of the sailing vessel.

Art. 21. Where, by any of these rules, one of the two vessels is to keep out of the way, the other shall keep her course and speed.

Art. 22. Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, avoid crossing ahead of the other.

Art. 23. Every steam vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, slacken her speed or stop or reverse.

Art. 24. Notwithstanding anything contained in these rules, every vessel, overtaking any other, shall keep out of the way of the overtaken vessel. Every vessel coming up with another vessel from any direction more than two points abaft her beam—that is, in such position with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's sidelights—shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

As by day the overtaking vessel cannot always know with certainty whether she is forward or abaft this direction from the other vessel she should, if in doubt, assume that she is an overtaking vessel and keep out of the way.

Art. 25. In narrow channels every steam vessel shall, when it is safe and practicable, keep to that side of the fairway or midchannel which lies on the starboard side of such vessel.

Art. 26. Sailing vessels under way shall keep out of the way of sailing vessels or boats fishing with nets, or lines, or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing vessels or boats.

Art. 27. In obeying and construing these rules, due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the above rules necessary in order to avoid immediate danger.

SOUND SIGNALS FOR VESSELS IN SIGHT OF ONE ANOTHER

Art. 28. When vessels are in sight of one another, a steam vessel under way whose engines are going at full speed astern shall indicate that fact by three short blasts on the whistle.

NO VESSEL UNDER ANY CIRCUMSTANCES TO NEGLECT PROPER PRECAUTIONS

Art. 29. Nothing in these rules shall exonerate any vessel, or the owner or master or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Art. 30. The exhibition of any light on board of a vessel of war of the United States or a revenue cutter may be suspended whenever, in the opinion of the Secretary of the Navy, the commander in chief of a squadron, or the commander of a vessel acting singly, the special character of the service may require it.

DISTRESS SIGNALS

Art. 31. When a vessel is in distress and requires assistance from other vessels or from the shore, the following shall be the signals to be used or displayed by her, either together or separately, namely:

In the daytime: A continuous sounding with any fog-signal apparatus, or firing a gun.

At night: First, flames on the vessel as from a burning tar barrel, oil barrel, and so forth.

Second. A continuous sounding with any fog-signal apparatus, or firing a gun.

RULES FOR LIGHTS FOR CERTAIN CLASSES OF VESSELS

RULES FOR LIGHTS FOR CERTAIN CLASSES OF VESSELS NAVIGATING THE HARBORS, RIVERS, AND INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, AND THE RED RIVER OF THE NORTH, AND RIVERS EMPTYING INTO THE GULF OF MEXICO, AND THEIR TRIBUTARIES

The following rules for lights to be carried by ferryboats, rules for lights for barges and canal boats in tow of steam vessels, rules for lights for rafts and other water craft navigating by hand power, horsepower, or by the current of the river, rule relating to use of searchlight, rule prohibiting unnecessary sounding of the steam whistle, rule prohibiting the carrying of unauthorized lights on steam vessels, and rules relating to drawbridges over navigable water of the United States were adopted by the Board of Supervising Inspectors, Steamboat Inspection Service, and approved by the Secretary of Commerce.

These rules concerning lights shall be complied with in all weathers from sunset to sunrise.

RULES FOR LIGHTS TO BE CARRIED BY FERRYBOATS NAVIGATING THE HARBORS, RIVERS, AND INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, AND THE RED RIVER OF THE NORTH, AND RIVERS EMPTYING INTO THE GULF OF MEXICO, AND THEIR TRIBUTARIES [2]

Ferryboats propelled by machinery and navigating the harbors, rivers, and other inland waters of the United States, except the Great Lakes and their connecting and tributary waters as far east as Montreal, and the Red River of the North, and rivers emptying into the Gulf of Mexico, and their tributaries, shall carry the range lights and the colored side lights required by law to be carried on steam vessels navigating those waters, except that *double-end ferryboats* shall carry a central range of clear, bright, white lights, showing all around the horizon, placed at equal altitudes forward and aft, also on the starboard side a green light, and on the port side a red light, of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 2 miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, and so fixed as to throw the light from right ahead to 2 points abaft the beam on their respective sides.

The green and red lights shall be fitted with inboard screens projecting at least 3 feet forward from the lights, so as to prevent them from being seen across the bow.

Local inspectors in districts having ferryboats shall, whenever the safety of navigation may require, designate for each line of such boats a certain light, white or colored, which will show all around the horizon, to designate and distinguish such lines from each other, which lights shall be carried on a flagstaff amidships, 15 feet above the white range lights.

RULES FOR LIGHTS FOR BARGES AND CANAL BOATS IN TOW OF STEAM VESSELS AND FOR LIGHTS AND DAY SIGNALS FOR DREDGES, VESSELS WORKING ON WRECKS, ETC., NAVIGATING THE HARBORS, RIVERS, AND OTHER INLAND WATERS OF THE UNITED STATES, EXCEPT THE GREAT LAKES AND THEIR CONNECTING AND TRIBUTARY WATERS AS FAR EAST AS MONTREAL, AND THE RED RIVER OF THE NORTH, AND RIVERS EMPTYING INTO THE GULF OF MEXICO, AND THEIR TRIBUTARIES

Lights for barges and canal boats in tow of steam vessels on certain inland waters on the seaboard, except the Hudson River and adjacent waters and Lake Champlain.—On the harbors, rivers, and other inland waters of the United

[2] See act of Congress approved June 9, 1910, effective on and after July 9, 1910, prescribing lights that shall be carried by certain classes of vessels of not more than 65 feet in length, amendatory to these rules, p. 334.

States, except the Great Lakes and their connecting and tributary waters as far east as Montreal, and the Red River of the North, and rivers emptying into the Gulf of Mexico, and their tributaries, and except on the waters of the Hudson River and its tributaries from Troy to the boundary lines of New York Harbor off Sandy Hook, as defined pursuant to section 2 of the act of Congress of February 19, 1895, the East River, and Long Island Sound (and the waters entering thereon, and to the Atlantic Ocean), to and including Narragansett Bay, R. I., and tributaries, and Lake Champlain, barges (except scows) and canal boats in tow of steam vessels shall carry lights as follows:

Barges and canal boats towing astern of steam vessels, when towing singly, or what is known as "tandem towing", shall each carry a green light on the starboard side and a red light on the port side, and a white light on the stern, except that the last vessel of such tow shall carry two white lights on her stern, athwartship, horizontal to each other, not less than 5 feet apart, and not less than 4 feet above the deck house, and so placed as to show all around the horizon.

When two or more boats are abreast, the colored lights shall be carried at the outer sides of the bows of the outside boats. Each of the outside boats in last tier of a hawser tow shall carry a white light on her stern.

The white light required to be carried on stern of a barge or canal boat carrying red and green side lights shall be carried in a lantern so constructed that it shall show an unbroken light over an arc of the horizon of 12 points of the compass, namely, for 6 points from right aft on each side of the vessel, and shall be of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 2 miles.

Barges or canal boats towing alongside a steam vessel shall, if the deck, deck houses, or cargo of the barge or canal boat be so high above water as to obscure the side lights of the towing steamer when being towed on the starboard side of the steamer, carry a green light upon the starboard side; and when towed on the port side of the steamer, a red light on the port side of the barge or canal boat; and if there is more than one barge or canal boat abreast, the colored lights shall be displayed from the outer side of the outside barges or canal boats.

The colored side lights referred to in these rules for barges and canal boats in tow shall be fitted with inboard screens, so as to prevent them from being seen across the bow, and of such a character as to be visible on a dark night, with a clear atmosphere, at a distance of at least 2 miles, and so constructed as to show a uniform and unbroken light over an arc of the horizon of 10 points of the compass, and so fixed as to throw the light from right ahead to 2 points abaft the beam on either side. The minimum size of the glass globes shall not be less than 6 inches in diameter and 5 inches high in the clear.

Scows when being towed by steam vessels on the waters covered by the first paragraph of these rules shall carry a white light at each end of each scow, except that when such scows are massed in tiers, two or more abreast, each of the outside scows shall carry a white light on its outer bow, and the outside scows in the last tier shall each carry, in addition, a white light on the outer part of the stern. The white light shall be carried not less than 8 feet above the surface of the water, and shall be so placed as to show an unbroken light all around the horizon, and shall be of such a character as to be visible on a dark night with a clear atmosphere at a distance of at least 5 miles.

RULES FOR LIGHTS AND DAY SIGNALS TO BE CARRIED BY VESSELS, DREDGES OF ALL TYPES, AND VESSELS WORKING ON WRECKS OR OTHER OBSTRUCTIONS TO NAVIGATION, OR MOORED FOR SUBMARINE OPERATION, OR MADE FAST TO A SUNKEN OBJECT WHICH MAY DRIFT WITH THE TIDE OR BE TOWED[3]

Rule for signals to be displayed by a towing vessel when towing a submerged or partly submerged object upon a hawser when no signals are displayed upon the object which is towed.—The vessel having the submerged object in tow shall display, by day, where they can best be seen, two shapes, one above the other, not less than 6 feet apart, the lower shape to be carried not less than 10 feet above the deck house. The shapes shall be in the form of a double frustum of a cone, base to base, not less than 2 feet in diameter at the center nor less than 8 inches at the ends of the cones, and to be not less than 4 feet lengthwise

[3] Adopted by executive committee of Board of Supervising Inspectors on July 22, 1914, and approved by Secretary of Commerce on July 28, 1914. Adopted by Board of Supervising Inspectors on Jan. 20, 1915, and approved by the Secretary of Commerce on Apr 12, 1915.

from end to end, the upper shape to be painted in alternate horizontal stripes of black and white, 8 inches in width, and the lower shape to be painted a solid bright red.

By night the towing vessel shall display the regular side lights, but in lieu of the regular white towing lights shall display four lights in a vertical position not less than 3 feet nor more than 6 feet apart, the upper and lower of such lights to be white, and the two middle lights to be red, all of such lights to be of the same character as is now prescribed for the regular towing lights.

Rule for steamers, derrick boats, lighters, or other types of vessels made fast alongside a wreck, or moored over a wreck which is on the bottom or partly submerged or which may be drifting.—Steamers, derrick boats, lighters, or other types of vessels made fast alongside a wreck, or moored over a wreck which is on the bottom or partly submerged, or which may be drifting, shall display by day two shapes of the same character and dimensions and displayed in the same manner as required by the foregoing rule, except that both the shapes shall be painted a solid bright red; but where more than one vessel is working under the above conditions, the shapes need be displayed only from one vessel on each side of the wreck from which it can best be seen from all directions.

By night this situation shall be indicated by the display of a white light from the bow and stern of each outside vessel or lighter not less than 6 feet above the deck, and in addition thereto there shall be displayed in a position where they may best be seen from all directions two red lights carried in a vertical line not less than 3 feet nor more than 6 feet apart, and not less than 15 feet above the deck.

Rule for dredges which are held in stationary position by moorings or spuds.—Dredges which are held in stationary position by moorings or spuds shall display by day two red balls not less than 2 feet in diameter and carried in a vertical line not less than 3 feet nor more than 6 feet apart, and at least 15 feet above the deck house and in such a position where they can best be seen from all directions. By night they shall display a white light at each corner, not less than 6 feet above the deck, and in addition thereto there shall be displayed in a position where they may best be seen from all directions two red lights carried in a vertical line not less than 3 feet nor more than 6 feet apart, and not less than 15 feet above the deck. When scows are moored alongside a dredge in the foregoing situation they shall display a white light on each outboard corner, not less than 6 feet above the deck.

Rule for self-propelling suction dredges under way with their suctions on the bottom.—Self-propelling suction dredges under way with their suction on the bottom shall display by day the same signals as are used to designate any steamer not under control; that is to say, two black balls not less than 2 feet in diameter and carried not less than 15 feet above the deck house, and where they may best be seen from all directions.

By night they shall carry, in addition to the regular running lights, two red lights of the same character as the masthead light, in the same vertical plane and underneath the masthead light, the red lights to be not less than 3 feet nor more than 6 feet apart and the upper red light to be not less than 4 feet and not more than 6 feet below the white masthead light, and on or near the stern two red lights in the same vertical plane not less than 4 feet nor more than 6 feet apart, to show through 4 points of the compass; that is, from right astern to 2 points on each quarter.

Rule for vessels which are moored or anchored and engaged in laying pipe or operating on submarine construction or excavation.—Vessels which are moored or anchored, and engaged in laying pipe or operating on submarine construction or excavation shall display by day, not less than 15 feet above the deck, where they can best be seen from all directions, two balls not less than 2 feet in diameter, in a vertical line not less than 3 feet and not more than 6 feet apart, the upper ball to be painted in alternate black and white vertical stripes 6 inches wide, and the lower ball to be painted a solid bright red. By night they shall display three red lights, carried in a vertical line not less than 3 feet nor more than 6 feet apart and not less than 15 feet above the deck, and in such position as may best be seen from all directions.

All the lights required by these special rules for dredges, wrecking boats, lighters, etc., shall be of such size and character as to be visible on a dark night with a clear atmosphere for a distance of at least 2 miles.

Rule for vessels which are moored or at anchor.—Vessels of more than 300 gross tons, propelled by machinery, when moored or anchored in a fairway or channel where traffic is liable to congestion or confusion, shall display between sunrise and sunset, on the forward part of the vessel where it can best be observed from other vessels, one black ball or shape not less than 2 feet in diameter.

Rule for lights to be displayed on pipe lines.—Pipe lines attached to dredges, and either floating or supported on trestles, shall display by night one row of white lights not less than 8 feet nor more than 12 feet above the water, about equally spaced and in such number as to mark distinctly the entire length and course of the line, the intervals between lights where the line crosses navigable channels to be not more than 30 feet. There shall also be displayed on the shore or discharge end of the line two red lights, 3 feet apart, in a vertical line with the lower light at least 8 feet above the water, and if the line is to be opened at night for the passage of vessels, a similar arrangement of lights shall be displayed on each side of the opening. The lights shall be of the same size and character as specified in rule 5 above.

Rule for passing signals.—Vessels intending to pass dredges or other types of floating plant working in navigable channels, when within a reasonable distance therefrom and not in any case over a mile, shall indicate such intention by blowing the passing signal prescribed in the local pilot rules for vessels under way, which shall be answered in the usual manner from said plant if the channel is clear and the approaching vessel may pass on the course indicated; otherwise the floating plant shall sound the alarm or danger signal and the approaching vessel shall slow down or stop and await further signal from the plant.

When the pipe line from a dredge crosses the channel in such a way that an approaching vessel, owing to excessive draft or for other reasons, cannot pass around the pipe line or dredge, a signal shall be given from the vessel by sounding 4 blasts of the whistle, which shall be answered by a like signal from the dredge. The pipe line shall then be opened for the passage of the vessel as soon as practicable; when the line is open ready for passage, the dredge shall so indicate by sounding the usual passing signal, and the approaching vessel shall promptly pass the dredge.

Rule for speed of vessels passing floating plant working in channels.—Steamers with or without tows, passing floating plant working in channels, shall reduce their speed sufficiently to insure the safety of both said plant and themselves, and when passing within 200 feet of said plant their speed shall not exceed 5 miles per hour. While passing over lines of said plant, propelling machinery shall be stopped.

Rule for light-draft vessels passing floating plant.—Vessels whose draft permits shall keep outside of the buoys marking the ends of mooring lines of floating plant working in channels.

Rule for aids to navigation marking floating-plant moorings.—Breast, stern, and bow anchors of floating plant working in navigable channels shall be marked by barrel or other suitable buoys. By night approaching vessels shall be shown the location of adjacent buoys by throwing a suitable beam of light from said plant on the buoys until the approaching vessel has passed, or the buoys may be lighted by red lights, visible in all directions, of the same size and character as specified in rule 5 above: *Provided*, That the foregoing provisions of this paragraph shall not apply to floating plant working in the following waters of New York Harbor and adjacent waters; namely, the East River, the North River (Battery to Spuyten Duyvil), and the Harlem River.

Rule for obstruction of channel by floating plant.—Channels shall not be unnecessarily obstructed by any dredge or other floating plant. While vessels are passing such plant, all lines running therefrom across the channel on the passing side, which may interfere with or obstruct navigation, shall be slacked to the bottom of the channel.

Rule for protection of marks placed for the guidance of floating plant.—Vessels shall not run over anchor buoys, or buoys, stakes, or other marks placed for the guidance of floating plant working in channels; and shall not anchor on the ranges of buoys, stakes, or other marks placed for the guidance of such plant.

NOTE.—If it is necessary to prohibit or limit the anchorage or movement of vessels within certain areas in order to facilitate the work of improvement, application should be made through official channels for establishment by the Secretary of War of special or temporary regulations for this purpose.

Rule for clearing of channels.—When special or temporary regulations have not been prescribed and action under these rules and regulations will not afford clear passage, floating plant in narrow channels shall, upon notice, move out of the way of vessels a sufficient distance to allow them a clear passage. Vessels desiring passage hall, however, give the mater of the floating plant ample notice in advance of the time they expect to pass.

Rule relating to the use of searchlights.—Any master or pilot of any steam vessel who shall flash or cause to be flashed the rays of the searchlight into the pilot house of a passing vessel shall be deemed guilty of misconduct and shall be liable to have his license suspended or revoked.

Rule prohibiting unnecessary sounding of the steam whistle.—The Board of Supervising Inspectors, at their annual meeting of January 1907 adopted the following rule:

Unnecessary sounding of the steam whistle is prohibited within any harbor limits of the United States. Whenever any licensed officer in charge of any steamer authorizes or permits such unnecessary whistling, upon conviction thereof before any board of inspectors having jurisdiction, such officer shall be suspended from acting under his license as the inspectors trying the case may deem proper.

Rule prohibiting the carrying of unauthorized lights on steam vessels.—Any master or pilot of any steam vessel who shall authorize or permit the carrying of any light, electric or otherwise, not required by law, on the outside structure of the cabin or hull of the vessel that in any way will interfere with distinguishing the signal lights shall, upon conviction thereof before any board of inspectors having jurisdiction, be deemed guilty of misconduct and shall be liable to have his license suspended or revoked.

REGULATION OF MOTORBOATS

AN ACT To amend laws for preventing collisions of vessels and to regulate equipment of certain motorboats on the navigable waters of the United States

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the words "motor boat", where used in this act, shall include every vessel propelled by machinery and not more than sixty-five feet in length, except tugboats and towboats propelled by steam. The length shall be measured from end to end over the deck, excluding sheer: *Provided*, That the engine, boiler, or other operating machinery shall be subject to inspection by the local inspectors of steam vessels, and to their approval of the design thereof, on all said motor boats which are more than forty feet in length and which are propelled by machinery driven by steam.

SEC. 2. That motor boats subject to the provisions of this Act shall be divided into classes as follows:

Class 1. Less than twenty-six feet in length.

Class 2. Twenty-six feet or over and less than forty feet in length.

Class 3. Forty feet or over and not more than sixty-five feet in length.

SEC. 3. That every motor boat, in all weathers, from sunset to sunrise, shall carry the following lights, and during such time no other lights which may be mistaken for those prescribed shall be exhibited:

(*a*) Every motor boat of class 1 shall carry the following lights:

First. A white light aft to show all around the horizon.

Second. A combined lantern in the fore part of the vessel and lower than the white light aft showing green to the starboard and red to port, so fixed as to throw the light from right ahead to two points abaft the beam on their respective sides.

(*b*) Every motor boat of classes 2 and 3 shall carry the following lights:

First. A bright white light in the fore part of the vessel as near the stem as practicable, so constructed as to show an unbroken light over an arc of the horizon of twenty points of the compass, so fixed as to throw the light ten points on each side of the vessel, namely, from right ahead to two points abaft the beam on either side. The glass or lens shall be of not less than the following dimensions:

Class 2. Nineteen square inches.

Class 3. Thirty-one square inches.

Second. A white light aft to show all around the horizon.

Third. On the starboard side a green light so constructed as to show an unbroken light over an arc of the horizon of ten points of the compass, so fixed

as to throw the light from right ahead to two points abaft the beam on the starboard side. On the port side a red light so constructed as to show an unbroken light over an arc on the horizon of ten points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side. The glasses or lenses in the said sidelights shall be of not less than the following dimensions on motor boats of—

Class 2. Sixteen square inches.

Class 3. Twenty-five square inches.

On and after July 1, 1911, all glasses or lenses prescribed by paragraph (b) of section 3 shall be fresnel or fluted. The said lights shall be fitted with inboard screens of sufficient height and so set as to prevent these lights from being seen across the bow and shall be of not less than the following dimensions on motor boats of—

Class 2. Eighteen inches long.

Class 3. Twenty-four inches long: *Provided*, That motor boats as defined in this Act, when propelled by sail and machinery or under sail alone, shall carry the colored lights suitably screened, but not the white lights prescribed by this section.

SEC. 4. (*a*) Every motor boat under the provisions of this Act shall be provided with a whistle or other sound-producing mechanical appliance capable of producing a blast of two seconds or more in duration, and in the case of such boats so provided a blast of at least two seconds shall be deemed a prolonged blast within the meaning of the law.

(*b*) Every motor boat of class 2 or 3 shall carry an efficient foghorn.

(*c*) Every motor boat of class 2 or 3 shall be provided with an efficient bell, which shall be not less than eight inches across the mouth, on board of vessels of class 3.

SEC. 5. That every motor boat subject to any of the provisions of this Act, and also all vessels propelled by machinery other than by steam, more than sixty-five feet in length, shall carry either life preservers or life belts or buoyant cushions, or ring buoys, or other device, to be prescribed by the Secretary of Commerce, sufficient to sustain afloat every person on board, and so placed as to be readily accessible. All motor boats carrying passengers for hire shall carry one life preserver of the sort prescribed by the regulations of the Board of Supervising Inspectors for every passenger carried, and no such boat while so carrying passengers for hire shall be operated or navigated except in charge of a person duly licensed for such service by the local board of inspectors. No examination shall be required as the condition of obtaining such license, and any such license shall be revoked or suspended by the local board of inspectors for misconduct, gross negligence, recklessness in navigation, intemperance, or violation of law on the part of the holder, and if revoked, the person holding such license shall be incapable of obtaining another such license for one year from the date of revocation: *Provided*, That motor boats shall not be required to carry licensed officers except as required in this Act.

SEC. 6. That every motor boat and also every vessel propelled by machinery other than by steam, more than sixty-five feet in length, shall carry ready for immediate use the means of promptly and effectually extinguishing burning gasoline.

SEC. 7. That a fine not exceeding $100 may be imposed for any violation of this Act. The motor boat shall be liable for the said penalty and may be seized and proceeded against, by way of libel, in the district court of the United States for any district within which such vessel may be found.

SEC. 8. That the Secretary of Commerce shall make such regulations as may be necessary to secure the proper execution of this Act by collectors of customs and other officers of the Government. And the Secretary of the Department of Commerce may, upon application therefor, remit or mitigate any fine, penalty, or forfeiture relating to motor boats except for failure to observe the provisions of section 6 of this Act.

SEC. 9. That all laws and parts of laws only insofar as they are in conflict herewith are hereby repealed: *Provided*, That nothing in this Act shall be deemed to alter or amend acts of Congress embodying or revising international rules for preventing collisions at sea.

SEC. 10. That this Act shall take effect on and after thirty days after its approval.

Approved June 9, 1910.

Numbering motor boats.—Every undocumented vessel operated in whole or in part by machinery, owned in the United States and found on the navigable waters thereof, except public vessels, and vessels not exceeding 16 feet in length measured from end to end over the deck, excluding sheer, temporarily equipped with detachable motors, shall be numbered. Such numbers shall be not less in size than 3 inches and painted or attached to each bow of the vessel in such manner and color as to be distinctly visible and legible.

The said numbers, on application of the owner or master, shall be awarded by the collector of customs of the district in which the vessel is owned and a record thereof kept in the customhouse of the district in which the owner or managing owner resides. No numbers not so awarded shall be carried on the bows of such vessel.

Meteorological table compiled by the United States Weather Bureau

(Norfolk, Va., Observatory Station, lat. 36°51′ N., long. 76°17′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind												32	
	Mean	Extremes			Mean				Extremes					Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours	Average hourly velocity	Highest velocity[1]	Average number of times (observations at 8 a. m. and 8 p. m.) from—									Number of days gales 32 miles or over[1]	Number of days fog
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range								N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*													
January	30.13	30.95	28.98	1.97	40.6	48.7	32.6	16.1	80	5	75	71	5.6	3.10	11	2.22	13.4	52	9	12	3	6	9	11	6	6	0	4	2
February	30.11	30.83	29.04	1.79	42.7	50.7	34.7	16.0	81	2	79	70	5.2	3.22	11	3.45	13.3	49	10	9	3	7	8	7	7	5	0	3	2
March	30.03	30.91	28.84	2.07	48.2	56.5	39.9	16.6	92	14	78	67	5.1	3.77	11	2.78	14.3	57	9	9	5	8	11	9	5	6	0	5	1
April	30.01	30.71	29.28	1.43	56.8	65.9	47.7	18.2	95	23	72	65	4.8	3.23	10	5.15	13.4	52	6	8	5	8	14	8	5	6	0	3	(2)
May	30.00	30.55	29.37	1.18	66.2	75.3	57.2	18.1	98	38	60	67	4.8	3.81	11	3.78	12.1	57	6	8	7	10	11	11	4	5	0	2	1
June	30.00	30.44	29.46	.98	74.4	82.6	66.2	16.4	102	49	53	70	4.9	4.22	11	5.97	11.3	59	6	8	6	12	12	10	3	3	0	2	(2)
July	30.00	30.38	29.61	.77	78.7	86.5	71.0	15.5	102	57	45	72	5.0	5.75	12	3.60	10.8	51	4	6	6	9	14	16	4	3	0	2	(2)
August	30.00	30.41	29.37	1.04	77.4	84.8	70.0	14.8	105	56	49	73	5.0	5.22	12	6.64	10.6	63	5	9	7	8	14	12	4	3	0	1	(2)
September	30.06	30.51	29.35	1.16	71.6	78.8	64.4	14.4	100	40	60	73	4.6	3.23	8	4.23	11.0	56	8	14	5	10	10	6	4	3	0	1	(2)
October	30.07	30.57	29.37	1.20	62.5	69.8	55.2	14.6	91	31	60	70	4.4	3.04	8	6.29	11.8	47	10	12	5	8	10	8	4	5	0	1	2
November	30.11	30.72	29.15	1.57	51.4	58.9	44.0	14.9	81	17	64	69	4.6	2.16	8	5.48	12.5	46	11	9	3	5	10	10	6	6	0	2	2
December	30.13	30.81	29.32	1.49	43.1	50.8	35.4	15.4	76	5	71	71	5.4	3.34	10	2.52	12.6	57	13	10	3	4	8	10	8	6	0	2	2
Mean	30.05				59.5	67.4	51.5	15.9				70	5.0				12.3													
Total														44.09	123				97	114	58	95	131	118	60	57	0	28	13

[1] Wind velocities in true values.
[2] Less than 1.

Meteorological table compiled by the United States Weather Bureau—Continued

(Hatteras, N. C., Observatory Station, lat. 35°15′ N., long. 75°40′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind											Number of days gales 32 miles or over[1]	Number of days fog
	Mean	Extremes			Mean				Extremes					Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours	Average hourly velocity	Highest velocity[1]	Average number of times (observations at 8 a. m. and 8 p. m.) from—											
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range								N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*													
January	30.14	30.78	29.06	1.72	47.1	52.7	41.5	11.2	74	11	63	81	5.8	4.42	12	3.42	14.7	56	14	10	3	2	5	13	8	7	0	3	2
February	30.11	30.74	29.22	1.52	47.4	54.0	40.9	13.1	73	11	62	79	5.4	4.03	12	4.34	14.8	53	12	10	4	3	4	9	6	8	0	3	2
March	30.04	30.75	29.01	1.74	52.0	58.2	45.8	12.4	82	25	57	78	4.9	4.25	12	2.76	15.0	57	10	13	5	3	7	13	5	6	0	3	2
April	30.01	30.63	29.10	1.53	59.8	65.9	53.8	12.1	85	31	54	76	4.5	3.54	10	4.49	14.2	59	6	12	5	3	7	16	6	5	0	2	1
May	30.01	30.48	29.20	1.28	68.7	74.4	63.0	11.4	88	43	45	77	4.8	3.71	9	6.12	12.8	44	6	12	5	5	6	19	6	3	0	1	(2)
June	30.01	30.37	29.49	.88	75.6	80.6	70.6	10.0	91	53	38	80	5.1	4.52	10	6.81	12.2	50	6	12	6	5	7	18	4	2	0	1	(2)
July	30.01	30.33	29.33	1.00	78.2	83.3	73.2	10.1	93	60	33	81	4.8	5.49	12	7.72	12.0	49	3	8	5	3	11	25	5	2	0	1	(2)
August	30.00	30.33	29.54	.79	78.0	82.8	73.2	9.6	92	60	32	79	4.7	5.75	12	5.50	11.2	80	5	11	5	4	6	23	6	2	0	1	0
September	30.06	30.48	29.37	1.11	74.5	78.9	70.0	8.9	92	50	42	79	4.9	4.61	9	9.32	12.1	57	7	22	5	4	5	9	5	3	0	1	(2)
October	30.06	30.48	29.37	1.11	65.9	71.1	60.8	10.3	90	41	49	77	4.5	4.95	9	4.82	13.2	52	10	20	4	4	5	8	5	6	0	1	1
November	30.11	30.67	29.09	1.58	56.3	61.4	51.2	10.2	79	26	53	78	5.1	3.45	9	6.16	13.7	53	17	12	2	2	3	10	8	6	0	2	1
December	30.13	30.70	29.34	1.36	50.1	54.6	45.6	9.0	75	8	67	80	5.6	4.21	11	3.41	14.6	51	18	11	1	1	4	8	10	9	0	4	1
Mean	30.06	.....	.....	.....	62.8	68.2	57.5	10.7	.....	.....	.....	79	5.0	.....	.....	.....	13.4	..	...	...	...	...	...	...	...	...	...	...	...
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	52.97	127	.....	.....	.....	114	153	50	39	70	171	74	59	0	23	10

[1] Wind velocities in true values.
[2] Less than 1.

Meteorological table compiled by the United States Weather Bureau—Continued

(Wilmington, N. C., Observatory Station, lat. 34°14′ N., long. 77°57′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind										Number of days gales 32 miles or over[1]	Number of days fog
	Mean	Extremes			Mean				Extremes								Average hourly velocity	Highest velocity[1]	Average number of times (observations at 8 a. m. and 8 p. m.) from—										
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours			N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*												
January	30.14	30.91	29.15	1.76	46.5	56.3	38.2	18.1	80	9	71	74	5.4	3.29	11	2.95	8.2	38	10	11	3	3	6	12	12	5	0	(2)	2
February	30.12	30.76	29.07	1.69	47.9	57.8	39.6	18.2	81	5	76	74	5.3	3.26	10	1.89	8.7	41	10	10	5	2	4	10	11	4	0	(2)	1
March	30.05	30.77	29.18	1.59	53.3	63.9	45.4	18.5	94	20	74	71	4.9	3.17	10	2.31	9.0	49	7	12	4	4	8	12	10	5	0	(2)	1
April	30.03	30.63	29.30	1.33	62.0	70.6	52.4	18.2	93	28	65	70	4.6	2.66	9	3.24	9.2	47	5	9	4	2	10	15	10	5	0	(2)	1
May	30.01	30.47	29.39	1.08	70.8	78.4	61.2	17.2	97	38	59	70	4.8	3.44	9	2.52	7.9	41	5	10	6	4	7	18	10	2	0	(2)	(2)
June	30.01	30.39	29.41	.98	76.8	84.3	68.3	16.0	100	51	49	74	5.3	5.10	12	2.77	7.4	34	4	10	7	4	7	15	10	3	0	(2)	(2)
July	30.01	30.35	29.14	1.21	79.1	86.9	71.9	15.0	103	54	49	77	5.4	7.13	14	5.68	7.2	40	3	8	4	5	9	21	10	2	0	(2)	(2)
August	30.00	30.33	29.45	.88	77.6	86.1	70.9	15.2	101	56	45	77	5.2	6.36	14	3.58	6.3	53	4	11	5	3	7	19	11	2	0	(2)	(2)
September	30.05	30.48	29.12	1.36	73.1	82.1	66.3	15.8	100	42	58	78	5.2	4.51	10	5.40	6.7	50	10	18	6	3	6	8	7	2	0	(2)	1
October	30.06	30.67	29.09	1.58	65.3	73.4	55.6	17.9	93	31	62	71	4.0	3.27	8	5.31	7.1	41	12	18	5	4	6	6	6	5	0	(2)	1
November	30.12	30.73	28.98	1.75	56.0	64.6	45.7	18.9	83	20	63	73	4.4	1.96	7	1.74	7.1	38	13	13	4	2	5	9	10	4	0	(2)	1
December	30.15	30.76	29.18	1.58	49.1	57.5	39.4	18.2	80	6	74	74	5.4	2.78	10	2.41	7.6	38	13	13	2	1	.5	9	13	5	1	(2)	2
Mean	30.06				63.1	71.8	54.6	17.2				74	5.0				7.6												
Total														46.93	123				96	143	55	37	80	154	120	44	1	2	12

[1] Wind velocities in true values.
[2] Less than 1.

Meteorological table compiled by the United States Weather Bureau—Continued

(Charleston, S. C., Observatory Station, lat. 32°47′ N., long. 79°56′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind										Number of days gales 32 miles or over [1]	Number of days fog
	Mean	Extremes			Mean				Extremes					Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours	Average hourly velocity	Highest velocity [1]	Average number of times (observations at 8 a. m. and 8 p. m.) from—											
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range								N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*												
January	30.15	30.83	29.17	1.66	49.9	57.3	42.6	14.7	80	10	70	74	5.3	3.02	10	3.98	10.4	40	10	10	3	4	5	14	9	7	0	(2)	4
February	30.12	30.66	29.20	1.46	52.4	59.9	44.8	15.1	82	7	75	73	5.1	2.98	10	3.18	11.1	41	7	9	4	3	6	10	9	8	0	(2)	3
March	30.06	30.71	29.33	1.38	57.4	65.2	49.6	15.6	91	24	70	72	4.9	3.02	9	3.14	11.6	43	7	11	6	3	9	13	6	7	0	1	2
April	30.03	30.79	29.29	1.50	64.5	71.9	57.2	14.7	93	32	61	70	4.3	2.53	7	8.30	11.4	52	6	7	6	5	12	12	7	5	0	1	(2)
May	30.01	30.46	29.48	.98	72.7	79.6	65.9	13.7	98	45	53	71	4.6	3.00	9	5.88	10.8	53	4	9	8	5	12	12	7	5	0	(2)	(2)
June	30.01	30.35	29.31	1.04	78.9	85.5	72.2	13.3	101	49	52	73	5.2	4.59	11	5.95	10.2	46	5	8	7	6	14	12	5	3	0	(2)	(2)
July	30.03	30.36	29.02	1.34	81.4	87.8	75.0	12.8	104	61	41	75	5.6	6.89	13	7.58	9.6	50	3	6	4	6	16	16	8	3	0	(2)	(2)
August	30.01	30.29	29.33	.96	81.0	87.1	74.9	12.2	102	62	40	77	5.4	6.53	12	5.89	9.2	81	4	6	6	4	13	18	8	3	0	(2)	(2)
September	30.04	30.43	29.27	1.16	76.6	82.9	70.4	12.5	100	49	51	77	4.9	4.53	10	10.57	10.3	55	12	14	8	6	7	5	4	4	0	(2)	1
October	30.06	30.59	28.91	1.68	67.8	74.7	61.0	13.7	95	37	58	73	4.4	3.27	7	9.55	11.0	50	15	16	5	4	6	7	4	5	0	(2)	1
November	30.12	30.70	29.14	1.56	58.1	65.7	50.6	15.1	83	23	60	71	4.2	2.14	7	5.84	10.0	43	12	12	4	3	6	8	8	7	0	(2)	2
December	30.15	30.74	29.28	1.46	51.7	59.3	44.0	15.3	81	12	67	74	5.3	2.72	9	3.46	10.3	40	12	12	3	3	5	8	10	9	0	(2)	3
Mean	30.07	.....	.....	.....	66.0	73.1	59.0	14.1	.....	.....	.....	74	4.9	.....	.....	.....	10.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	45.22	114	.....	.....	.....	97	120	64	52	111	135	85	66	0	5	17

[1] Wind velocities in true values.
[2] Less than 1.

Meteorological table compiled by the United States Weather Bureau—Continued

(Jacksonville, Fla., Observatory Station, lat. 30°20′ N., long. 81°39′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind										Number of days gales 32 miles or over [1]	Number of days fog
	Mean	Extremes			Mean				Extremes								Average hourly velocity	Highest velocity [1]	Averate number of times (observations at 8 a. m. and 8 p. m.) from—										
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours			N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*												
January	30.15	30.67	29.49	1.18	55.4	64.6	47.4	17.2	83	15	68	75	4.6	2.80	9	3.09	9.2	46	11	11	3	6	6	10	7	8	0	1	3
February	30.12	30.60	29.37	1.23	58.0	66.7	49.2	17.5	86	10	76	73	4.3	2.97	8	4.16	9.5	58	7	8	4	5	5	10	6	11	0	2	2
March	30.06	30.64	29.39	1.25	62.6	71.8	54.0	17.8	91	26	65	70	4.1	2.91	8	4.47	9.8	58	7	10	5	10	5	9	7	9	0	3	1
April	30.04	30.43	29.32	1.11	68.7	77.3	59.8	17.5	92	34	58	67	3.9	2.38	7	4.81	9.7	46	5	8	8	14	6	9	4	6	0	1	0
May	30.00	30.41	29.55	.86	75.0	83.3	66.4	16.9	98	46	52	68	4.2	4.02	9	9.06	9.2	50	3	12	8	13	7	9	5	5	0	1	0
June	30.01	30.26	29.53	.73	79.9	87.9	71.9	16.0	101	54	47	73	5.0	5.33	13	7.66	9.0	54	5	8	6	13	9	12	5	2	0	2	0
July	30.03	30.29	29.25	1.04	82.1	89.9	73.9	16.0	104	65	39	75	5.0	6.71	15	4.89	8.7	47	3	5	6	11	12	18	5	2	0	3	0
August	30.01	30.27	29.04	1.23	81.7	89.3	73.7	15.6	101	64	37	76	4.6	5.81	15	6.18	8.4	44	3	5	5	15	9	16	6	3	0	1	0
September	30.00	30.25	29.19	1.06	78.3	85.6	71.5	14.1	99	49	50	78	4.6	7.35	13	9.86	8.7	54	11	16	9	10	4	4	2	4	0	1	0
October	30.02	30.49	29.04	1.45	71.1	78.3	63.5	14.8	95	37	58	75	4.4	4.46	10	5.15	9.2	57	16	17	7	7	3	3	3	6	0	1	1
November	30.10	30.57	29.35	1.22	62.2	70.8	54.2	16.6	86	26	60	74	4.1	1.98	7	3.75	9.0	44	17	12	5	4	3	6	5	8	0	1	2
December	30.14	30.61	29.45	1.16	56.3	65.3	48.1	17.2	83	14	69	76	4.8	3.02	8	4.97	8.9	43	16	10	3	5	5	7	6	10	0	1	3
Mean	30.06				69.3	77.6	61.1	16.4				73	4.5				9.1												
Total														49.74	122				104	122	69	113	74	113	61	74	0	18	12

[1] Wind velocities in true values.

Meteorological table compiled by the United States Weather Bureau—Continued

(Jupiter, Fla., Observatory Station, lat. 26°57′ N., long. 80°07′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0-10	Precipitation			Wind											Number of days gales 32 miles or over [1]	Number of days fog
	Mean	Extremes			Mean				Extremes								Average hourly velocity	Highest velocity [1]	Average number of times (observations at 8 a. m. and 8 p. m.) from—											
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours			N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*													
January	30.10	30.48	29.66	0.82	64.3	72.4	58.4	14.0	83	21	59	81	4.9	3.58	10	6.38	10.7	37	8	5	8	9	5	6	6	15	0	0	0
February	30.08	30.45	29.54	.91	66.3	73.4	59.1	14.3	87	27	60	80	4.8	3.05	8	3.62	10.8	42	10	4	4	8	6	8	4	12	0	0	0
March	30.05	30.39	29.56	.83	69.4	76.5	62.6	13.9	89	33	56	78	4.1	3.12	7	4.97	11.3	38	7	5	10	11	9	6	6	8	0	0	0
April	30.04	30.34	29.61	.73	72.2	78.9	65.3	13.6	90	39	51	76	4.2	2.63	7	4.25	11.2	49	5	6	7	10	8	9	8	7	0	0	0
May	29.98	30.28	29.64	.64	76.4	82.4	69.9	12.5	93	53	40	79	4.6	4.76	10	8.76	10.2	40	3	7	11	14	9	9	7	2	0	0	0
June	30.01	30.25	29.63	.62	79.6	85.2	73.3	11.9	95	64	31	83	5.5	6.93	14	9.26	8.9	40	2	5	10	14	10	9	7	3	0	0	0
July	30.03	30.25	29.76	.49	81.0	87.0	74.7	12.3	96	67	29	82	4.9	5.37	14	3.40	8.1	33	3	2	7	16	10	13	7	4	0	0	0
August	30.00	30.19	29.20	.99	81.5	87.6	75.0	12.6	96	68	28	83	4.8	5.85	15	4.92	8.1	49	2	3	8	15	8	15	8	3	0	0	0
September	29.96	30.16	29.30	.86	80.6	85.8	74.4	11.4	93	61	32	82	5.5	9.56	17	6.67	9.3	63	5	9	14	14	6	5	4	3	0	0	0
October	29.96	30.30	29.18	1.12	76.8	81.8	70.7	11.1	94	48	46	80	5.4	9.48	15	13.18	11.7	58	8	18	13	6	4	4	3	6	0	1	0
November	30.05	30.32	29.71	.61	71.6	78.4	65.7	12.7	87	36	51	79	4.9	3.05	9	5.06	11.1	35	8	8	12	7	2	4	5	14	0	0	0
December	30.10	30.48	29.63	.85	66.3	73.2	59.6	13.6	86	24	62	81	5.0	2.87	9	5.75	10.5	32	9	5	8	8	4	6	7	15	0	0	0
Mean	30.03				73.8	80.2	67.4	12.8				80	4.9				10.2													
Total														60.25	135				70	77	112	132	81	91	72	92	0	3	2

[1] Wind velocities in true values.
[2] Less than 1.

Meteorological table compiled by the United States Weather Bureau—Continued

(Miami, Fla., observatory station, lat. 25°48′ N., long. 80°12′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–10	Precipitation			Wind											Number of days gales 32 miles or over [1]	Number of days fog
	Mean	Extremes			Mean				Extremes								Average hourly velocity	Highest velocity [1]	Average number of times (observations at 8 a. m. and 8 p. m.) from—											
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours			N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*													
January	30.13	30.48	29.71	0.77	66.5	74.3	62.1	12.2	83	32	51	74	5.3	2.52	9	6.69	9.2	32	6	5	14	10	6	4	4	13	0	[2]	[2]
February	30.10	30.49	29.61	.88	67.1	74.8	61.1	13.7	85	27	58	72	4.8	1.83	6	2.51	9.0	36	5	3	8	9	5	5	5	15	0	[2]	[2]
March	30.08	30.41	29.61	.80	70.2	76.8	64.0	12.8	88	34	54	70	4.8	2.17	7	9.04	9.7	39	6	6	13	12	7	4	4	10	0	[2]	[2]
April	30.03	30.36	29.67	.69	72.8	79.7	67.8	11.9	89	45	44	69	5.0	3.09	7	3.22	9.5	34	5	7	17	12	7	3	3	6	0	[2]	[2]
May	29.99	30.22	29.66	.56	76.4	82.5	71.1	11.4	92	50	42	72	5.8	6.22	12	9.36	8.8	34	2	7	19	15	6	4	4	5	0	[2]	0
June	30.00	30.20	29.72	.48	80.0	85.4	74.5	10.9	92	65	27	74	6.5	6.86	13	7.15	7.5	36	2	7	18	14	7	5	4	3	0	[2]	0
July	30.04	30.24	29.49	.75	81.0	86.9	75.8	11.2	94	66	28	73	6.1	5.42	15	4.90	7.1	35	2	5	16	18	6	6	5	4	0	[2]	0
August	30.02	30.26	29.64	.62	81.4	87.3	76.4	10.9	93	67	26	73	5.9	6.17	15	6.12	7.4	40	2	5	23	17	4	4	2	5	0	[2]	0
September	29.97	30.18	27.61	2.57	80.1	86.0	75.4	10.6	92	69	23	76	6.3	8.34	18	10.58	8.1	84	6	9	19	11	4	4	2	5	0	[2]	0
October	29.97	30.24	29.12	1.12	77.0	82.8	72.6	10.2	91	52	39	75	6.1	8.44	16	9.53	9.0	53	8	13	20	8	2	2	2	7	0	[2]	[2]
November	30.06	30.40	29.62	.78	71.8	77.6	66.6	11.0	88	36	52	71	5.6	2.91	10	15.10	10.5	34	7	15	14	5	3	2	3	11	0	[2]	[2]
December	30.11	30.39	29.54	.85	68.0	75.2	62.5	12.7	84	34	50	74	5.3	1.69	7	5.31	8.7	41	10	5	10	10	5	3	4	15	0	[2]	1
Mean	30.04				74.4	80.7	69.1	11.6				73	5.6				8.7													
Total														55.66	135				61	87	191	141	63	46	42	99	0	1	2

[1] Wind velocities in true values.
[2] Less than 1.

Meteorological table compiled by the United States Weather Bureau—Continued

(Key West, Fla., observatory station, lat. 24°33′ N., long. 81°48′ W.)

Month	Barometer at 32° F. and mean sea level				Air temperature							Average relative humidity	Average amount of clouds, 0–16	Precipitation			Wind											Number of days gales 32 miles or over[1]	Number of days fog
	Mean	Extremes			Mean				Extremes								Average hourly velocity	Highest velocity[1]	Averate number of times (observations at 8 a. m. and 8 p. m.) from—											
	For month	Highest	Lowest	Range	For month	Mean max.	Mean min.	Range	Highest	Lowest	Range			Average fall	Number of days 0.01 inch or more	Maximum fall in 24 hours			N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm		
	Ins.	*Ins.*	*Ins.*	*Ins.*	°	°	°	°	°	°	°	%		*Ins.*		*Ins.*													
January	30.10	30.50	29.71	0.79	69.5	73.8	65.1	8.7	90	41	49	80	4.3	1.96	8	3.97	10.4	46	9	19	15	9	3	1	1	5	0	(2)	(2)
February	30.07	30.47	29.60	.87	70.5	75.1	65.9	9.2	87	44	43	76	3.3	1.34	6	2.99	10.2	44	11	13	12	8	3	2	2	5	0	(2)	(2)
March	30.05	30.47	29.69	.78	72.6	77.4	67.8	9.6	89	48	41	73	3.3	1.39	5	4.52	11.0	46	10	12	18	12	3	1	1	5	0	(2)	0
April	30.02	30.37	29.63	.74	75.7	80.5	71.0	9.5	91	54	37	71	3.3	1.29	4	3.23	10.4	45	9	9	19	12	2	2	1	6	0	(2)	0
May	29.97	30.25	29.67	.58	79.1	83.9	74.4	9.5	93	63	30	72	4.6	3.54	8	5.83	9.9	43	6	8	22	15	3	2	1	5	0	(2)	0
June	29.99	30.26	29.62	.64	81.9	86.8	77.1	9.7	100	65	35	74	5.1	4.24	11	5.48	9.2	40	3	5	21	18	6	3	1	3	0	(2)	0
July	30.03	30.24	29.77	.47	83.5	88.6	78.4	10.2	100	68	32	72	5.0	3.28	12	7.46	8.5	41	2	5	19	22	6	3	2	3	0	(2)	0
August	29.98	30.22	29.67	.55	83.5	88.8	78.2	10.6	100	68	32	72	5.0	4.51	14	8.32	8.6	40	2	4	29	19	3	2	1	2	0	(2)	0
September	29.94	30.17	29.13	1.04	82.2	87.2	77.2	10.0	97	69	28	75	5.4	6.70	16	11.95	9.6	84	3	12	23	12	5	2	1	2	0	(2)	0
October	29.94	30.28	28.47	1.81	79.1	83.4	74.8	8.6	92	59	33	76	5.1	6.00	13	13.54	10.4	76	5	23	17	8	3	2	1	3	0	(2)	0
November	30.02	30.48	29.61	.81	74.3	78.2	70.3	7.9	91	51	40	76	4.2	2.19	7	8.86	10.8	41	10	26	12	5	1	1	1	4	0	(2)	0
December	30.08	30.52	29.62	.90	70.3	74.5	66.2	8.3	88	44	44	78	4.0	1.67	7	3.93	10.2	44	11	26	9	8	3	1	1	3	0	(2)	(2)
Mean	30.02				76.8	81.5	72.2	9.3				75	4.4				9.9													
Total														38.11	112				81	162	216	148	41	22	14	46	0	1	(2)

[1] Wind velocities in true values.
[2] Less than 1.

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